

AVIATION WEEK

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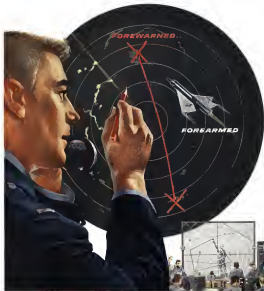
August 26, 1957 50 cents

**SEPR Specializes
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Douglas A4D Skyhawk



Simplicity, Economy Guide A4D Design



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The officers and men of the U.S.A.F.'s 44th Central and Warning Squadron are the "eyes and ears" of the nation's air defense. Through their diligence, our interceptors are forewarned and electronically directed to any unidentified aircraft.

FOREARMED

The pilots of the U.S.A.F.'s Air Defense Command are forewarned with advanced weapons systems like Convair's sophisticated F-102A all-weather delta interceptor. From the ground up, this formidable air defense team is keeping an eye on your freedom!

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The design, development and testing of advanced ordnance products and systems is one of the principal activities of the Research and Development group at Rheem Aircraft Division. The technical capabilities of Rheem in this field are evident in the numerous line of products currently being produced for the military and their suppliers.

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The Rheem developed Jupiter Nike Hercules system being tested in order that it will be Rheem.

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AVIATION CALENDAR

Aug. 31-Sept. 1-Midwest Airlines, Farm, 71
Waver, Ill.
Sept. 3-15-South International Aeronautical
Conference, Royal Aeronautical Society
and Institute of the Aeronautical Sciences,
Baltimore and London, England
Sept. 24-1957 Flying Day, Society of
British Aircraft Constructors, Farnborough,
England
Sept. 2-15-11th General Assembly, Inter-
national Union of Control and Control
Systems, an association with Illinois
State College, East, University of
Toronto, Canada
Sept. 7-Second Annual Convention of the
ONR Civil, Hotel Phillips, Kansas City,
Mo.
Sept. 8-15-Sixth Annual Census on In-
strument Landing, March 1957, Insti-
tute of Technology, Cambridge, Mass.
Sept. 9-11-11th Annual Meeting, Electron
Microscopy Society of America, Mass.
Society, Institute of Technology, Cam-
bridge, Mass.
Sept. 8-15-Twoth Annual International
Aeronautical Conference and Exhibit
Cleveland, September, Cleveland, Ohio
Sept. 10-Third Pacific Area National Meet-
ing, American Society for Testing Ma-
terials, Sheraton Palace Hotel, San Fran-
cisco, Calif.
Sept. 24-25-Meeting of Aeronautical
Society, Detroit, Mich.
Sept. 15-1957 Control Panel and Flying
Display, Royal Aeronautical Society, War-
ley, London, England
Sept. 15-21-4th Meeting, American So-
ciety of Mechanical Engineers, Sheraton
Hotel, Sheraton, Conn.
Sept. 25-First A. Whitney Aircraft Engine
Maintenance and Operation Forum, open-
ing by Southwest Airlines Co., VM
and Sheraton Hotel, Tex.
Sept. 26-27-28th Midwest Aeronautical
Conference, newly sponsored by Univer-
sity of Michigan Transportation Institute,
Wayne State University, and The
Aero Club of Michigan, Detroit, Mich.
(Continued on page 6)

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Flying Fair Lady

—Harriet Quimby, America's First Licensed Woman Pilot



(Photo courtesy Institute of Aeronautical Sciences)

Pretty Harriet Quimby attained success in two machine strongholds—journalism and aviation—in a day when women were not even allowed to vote.

While still in her teens, Miss Quimby became a newspaper reporter in San Francisco, and, in a short time, advanced to the position of Drama Editor on *Los Angeles Weekly* in New York. There she learned to fly under the guidance of John Moisant, Saratoga early-day aviator. It was on

August 3, 1911, that Miss Quimby became America's first licensed woman pilot. Then, following months of preparation, Miss Quimby flew the English Channel on April 16, 1912—the first woman to do so.

Miss Quimby returned to America and made exhibition appearances in the country and Mexico. Noted for her beauty as well as her daring, Miss Quimby was a symbol of increasing feminine equality for American women.



AVIATION DIVISION • PHILLIPS PETROLEUM COMPANY • BARTLESVILLE, OKLAHOMA

CONVAIR'S B-58 HUSTLER... America's newest, fastest bomber... built with BRIDGEPORT ALUMINUM

Striking through the skies at supersonic speeds and altitudes above 50,000 feet, Conva's B-58 Hustler—the U.S. Air Force's supersonic bomber—picks a lethal punch in its powerful delta-winged body.

Designed, developed and built by the Convair Division of General Dynamics Corporation, under the Air Force's system management concept, the B-58 is truly a remarkable engineering achievement.

Bridgeport is proud of playing a part in helping to bring this bomber of intensive into being by supplying high-strength aluminum extrusions and forgings used in the Hustler.

The new Convair bomber is another of the many military and commercial aircraft in which Bridgeport aluminum is used. It gives added resistance to the dependable service Bridgeport supplies in furnishing high-quality aluminum extrusions and forgings to meet aircraft requirements.

For prompt, dependable service on your requirements, just call the Bridgeport Sales Office nearest you.



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Office in Principal Cities

another example of how **RYAN BUILDS BETTER**



RYAN VERTIJET: A NEW DIMENSION FOR AIR POWER

The Air Force Ryan X-13 Vertijet—able to take off and land on its jet thrust in an area half the size of a tennis court—brings a new dimension to air power. This revolutionary aircraft combines unusual mobility, helicopter maneuverability, and jet speed. Not dependent on vulnerable runways or carrier decks, jet VTOLs make possible wide dispersal of aircraft in land theaters or on small ships in naval task forces—and can attack fighting altitude before most other jet planes can complete takeoff.

Extensive Air Force flight testing of the X-13 has dramatically demonstrated its ability to take off straight up on jet thrust... move sideways and back ward as well... make the transition from vertical to horizontal... and return back to vertical for a steep landing.

The unique performance of the X-13 is achieved by its advanced jet reaction control system. A product of Ryan engineering, it provides complete control of the airplane during hovering, zero-speed flight and in transition. Operated by conventional pilot's controls, the system requires no higher level of skill than that needed to fly a helicopter.

The X-13 opens a new chapter in aviation history. It begins at Ryan ten years ago—the first jet VTOL program in the world. Since then, working in the closest cooperation with the Air Force and the Navy, Ryan has successfully carried out one of the most intensive and costly engineering research projects of our time.

This intensive and energetic effort is typical of Ryan's work—in every field of aeronautics.

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On the face of it, you'd think turning out engines on schedule is easy task for volume production people like us. We make thousands of detail parts in our own plant, add to those thousands more received from suppliers all over the United States and you can see that timing is the key to schedule performance.

Keeping on schedule is important because the

Air Force and aircraft manufacturers have their concerns as to our production performance. If we miss—they miss.

On-time volume delivery is something that comes only from volume production experience. In this business of jet engine making, there's no short cut to being able to meet schedule—... you've got to know your business.

And our business is producing highest quality jet engines, on schedule, at lowest possible cost.



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Honeywell Rate Gyro
Type JRT
Shown in cut view



Now! Constant Damping Over Entire Operating Temperature Range

The new Honeywell Rate Gyro, Type JRT, is a precision instrument for measurement of absolute rates of rotation in inertial space. Fluid viscosity is electromechanically controlled to maintain a constant damping ratio over the entire operating temperature range of -65°F. to +175°F.

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BOSTON DIVISION

Resistance Welding of Jet Engines



HELPS PUT PROFIT
INTO MANUFACTURING

Pratt & Whitney Uses Sciaky Techniques To Slash Weight of J-57 Engines

The replacement of silver brazed steel with heavy resistance welded aluminum has made possible a significant weight reduction in Pratt & Whitney Aircraft's J-57 jet engine.

The part affected is the shroud stator of the compressor section. Before the heavy Sciaky welders were put into service, the shroud stators were made of steel, fabricated with a silver brazing process.

As a result of Pratt & Whitney's constant research for improvement, project engineers recommended the use of aluminum. Experiments showed that resistance welding, under the 7500 pound pressure delivered by the Sciaky welders, was the only means by which the aluminum parts could be joined without weldment cracks.

Five Sciaky patented Three-Phase

welders producing a total of 740,000 secondary amperes used for this operation represent the largest capacity system of such machines in the world. They are described by Pratt & Whitney Aircraft as the only welders capable of satisfactorily welding the aluminum shrouds.

Three of the five welders are equipped with Sciaky Proton-Controlled Electronic Counter Controls. The unique control makes it possible for users to get precisely what they set on the machine. There is no deviation and settings are consistent through the entire range of adjustment. Setup to repeat previous runs is simple.

For further information, write today for Bulletin No. 323 and 328, Sciaky Bros., Inc., 4031 W. 47th St., Chicago 26, Ill., PO Box 1-6560.



Clamping of the shroud stator being resistance welded.

Four Sciaky patented Three-Phase welders located in the East Hartford plant of Pratt & Whitney Aircraft. Since the photo was taken, a 30th machine has been added. They are the only welders capable of welding aluminum shrouds without breaking cracks.



The Conquest F-102A, designed to fly in the upper atmosphere, utilizes Silastic as a seal between fuselage and canopy. Silastic withstands temperatures down to -132°F without losing its elasticity and is unaffected by rays.

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SILICONE RUBBER

seals stay airtight at -130 F

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In sub-zero cold that would ruin the usefulness of organic rubber, seals of Silastic®, the Dow Corning silicone rubber, stay resistant and effective. Silastic is resistant to ozone, weathering, and temperature cycling from -130 to 500 F. It has very low compression set. Silastic parts are offered in a variety of shapes, sizes, and colors by leading rubber fabricators.

Typical Properties of Silastic for Seals

- Temperature range, °F -130 to 500
- Tensile strength, psi 3000 to 1200
- Elongation, % 250 to 400
- Tear strength, lb/in 120 to 350
- Compression set, % @ 500 F 25 to 50
- Hardness range, durometer 20 to 30
- Weather, ozone and ozone resistance Excellent

If you consider ALL the properties of a silicone rubber, you'll specify SILASTIC.



Dow Corning CORPORATION
MIDLAND, MICHIGAN

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Standard
or Custom
Designs...



Custom Designs Manufactured
by Electrical Industries



has the solution!



Customer-made Components Sealed
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Spreads Protection



The Multiple Seal builds in your
insulated electrical system
extra protection against moisture
and corrosion, and helps prevent
contamination from solder joints,
leakage and more.

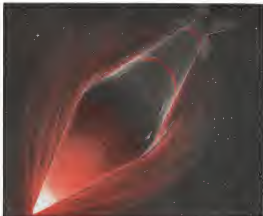
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protects for dimensional stability under continuous heat

As components and equipment grow smaller, and heat
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aerospace designs. For goodness sake get such a wide
range of quality insulations to be found under one roof
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HIGH-HEAT FLEXIBLE INSULATIONS, CDF offers a
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WHY BE LIMITED IN YOUR CHOICE OF FLIGHT DIRECTORS?

Bendix offers your pilots a wide choice

To show the wide range and flexibility of Bendix® Flight Director Systems, let's assume an ILS approach situation in which the airplane, on a 20° heading, is on a 10° right bank with its nose on the horizon, but slightly above the glide slope. The Course Deviation Indicator (as on all Bendix systems) shows actual and pre-set headings, TO-FROM indications, and position relative to ILS beam (or VOR radial). Now, let's see how attitude reference and command information are presented on three typical Bendix Flight Director Indicators.

BENDIX SERIES "300" SYSTEM

In this system the Flight Director Indicator presents compound roll and pitch commands. Sky and ground are represented on a sphere, as shown, and attitude is depicted by conventional airplane symbol. Secondary airplane symbol represents estimated attitude and, in this case, calls for nose-down, left bank maneuver. Command is satisfied when the two symbols coincide.

COURSE DEVIATION INDICATOR



FLIGHT DIRECTOR INDICATOR



BENDIX SERIES "300" SYSTEM

This system's Flight Director Indicator also shows compound steering commands in both roll and pitch axes. Sky and earth presentation is flat rather than spherical, and white line represents horizon. In this version, the two pointers, opposing curves, disengage compound attitude. Command is satisfied when wings of airplane symbol align with markers.



BENDIX SERIES "300" SYSTEM

The Flight Director Indicator in this system provides for compound steering commands in roll axis only. Flat gray and black areas represent sky and ground. Compound bar is a variable line extending up from bottom of indicator, and, in this example, calls for left turn. Commanded attitude is assumed when this needle is straight up and down through center of indicator. Small horizontal line's position with relation to vertical white dot scale along left edge shows whether airplane is above, below, or on glide slope beam.



With Bendix Flight Director Systems you have your choice of several types of presentation . . . and your choice of a single- or two-axis system. You don't buy features you don't want or need. Yet, you get all the features and advantages that you do want and need. When you think of flight direction, think of Bendix. Get the Bendix story.

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Eclipse-Pioneer Division

TECHNICAL, N. J.



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Industry to Get Key Missile Legality Rule

As Montreal Canada's ten-year program will be industry to worldwide communications system.

AMB Plans Full Operation by November

Three-member board will have staff of 40 to old research program to anticipate traffic battles.

A4D Design Opposes Complexity Trend

Smallest and lightest of U.S. jet planes, it stresses economy, ease of maintenance.

MOBILE ENGINEERING

Details of Flight 78
Blackburn Model 20
North American Model 20
North Star Model 20

ASPHALT ENGINEERING

Asphalt Model 20
Asphalt Model 20
Asphalt Model 20
Asphalt Model 20

EQUIPMENT

Equipment Model 20
Equipment Model 20
Equipment Model 20
Equipment Model 20

MANAGEMENT

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AVIATION WEEK

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Members of AEP and ABC

B. F. Goodrich answers de-icing problems 3 ways

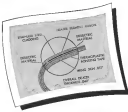
1. METAL-GLAD DE-ICERS -- Lydwight

3-P Greenflex metal-clad De-Iron, as used on Insulapac EC-133 switches, are tightly encased in aluminum and monon from end to end. Ribbon type electrical heating elements are sandwiched between layers of non-sagging, fused glass fabric, capped by an outer skin of monolon and as other specified metal. Preheated to the contour of the switch's leading edge, this De-Iron is attached with an adhesive bond.



3. PNEUMATIC DEVICES - 37 Goals

Permanent Deflators offer the best method of ice removal for large areas. Inself, rubber-reinforced fabric tubes, blown in line with the air stream, soften and deflate to wrap off ice. This chordless tube arrangement used on planes such as Lockheed's Super-Constellation on wings and the Grumman Albatross, smooths the flow of air over winged surfaces during the brief inflation period. This type of De-Icer is also being used as an add-on device because its permanent operation offers maximum maneuverability for the fiber stream.



■ 2. HEATED RUBBER—3.7 Goodrich samples

banded rubber is a lightweight method of supplying heat far in excess to localized areas such as air intakes, cowls, propeller blades and spinnets. Typical applications—Lockheed C-130 Hercules and C-119 Flying Boxcar—feature winged fairings heated by C-150 Heating elements arranged for proper heat pattern are sandwiched between thin, flexible sheets of rubber to fit complex curves or flat surfaces. Power density can be as high as 40 watts per sq.-overall thickness as small as .005".



For answers to your own specific ice problems, contact —

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 ants + Seal with + Hunting Rubber + Pressure
 Boiling Dippers + Elms + Arches + Aftersight +
 Mass and other members

EDITORIAL

Are We Really Saving Money?

Air Force and Navy have now completed most of their procurement requirements for fiscal 1988 in order to

ists under the expenditure ceilings imposed by the executive branch of the government. Some further pruning remains to be done, notably in research and development programs and in the middle area where duplications and technically related projects still abound. It is now possible to take a good look at just how much progress science, this reorganization will provide and what of facts it will have on the strength of military response.

The principle tactic of the military services to stay under the Fiscal 1988 capex/repair ceiling has been the production stretchout. Virtually every major aircraft production program for both services has been stretched to provide a lower rate of production and to defer delivery of finished products to later dates. The final attractiveness of this policy does not lie in saving money but rather in the fact that it pushes the payment of the bills for completed aircraft forward into another fiscal year.

What Stretchout Means

The stretchout doesn't owe any money because the bills for the completed hardware must eventually be paid. As a means of solving fiscal problems, the production stretchout resembles the homebuyer who cleans her house by sweeping all the dirt under the rug.

The production checklist also notes a significant delay in the modernization of combat equipment means that Strategic Air Command will be engaged with B-52 bombers and KC-135 jet tankers years later than originally scheduled. It means that Air Defense Command will not get its new generation of Mach 2 interceptors until much later than originally scheduled. It means that the Potential class of Navy aircraft carriers will have to continue to operate longer with a continuous element of obsolescence, fading and breaking.

Another policy promoted with an eye of economy is the 5% reduction in progress payments to military contractors. This again traps defence bids and will not serve a single penny. The reduction in progress payments plus the production stretchout may defer the final response halfway but considerably, but it does not alter the fact that sooner or later it will have to be paid.

'One-Shot Economies'

The recent history of the disaster response program has been dominated by the philosophy of deferred payment for the response bill. At the end of the Korean war, a reevaluation and close down of the war emergency production rates was necessary. But since that shutdown there has been a continued stretching of the response program with each new budget crisis; and it is stretched nearly close to the breaking point, and vital portions of

a truly balanced and effective response program, such as modern transports, are never demanded consistently.

For several years, the Defense Department has been telling Congress that "we can make these one-shot increases safely this year but next year we will risk increases that we really need to provide adequate support." What has happened is that the "one-shot" increases are made each year, but the proposed increase, even when forthcoming, is violated by the technique of deferring such as the production stretchout and replacement.

The process has now reached the point where even the Defense Department admits it cannot finance the new and program for an Air Force of 137 combat wings. For Fiscal 1989, the program is cut to 128 wings with USAF Secretary James Douglas already warning that under the expenditure limitations a further cut of one combat wing is in prospect. But even one combat wing will have their modernization severely delayed by the production shortfalls. The combination of cutback and stretchout means that we will have a smaller Air Force than planned, equipped with a higher percentage of obsolescent equipment than is technically necessary.

Even major donors are the budgetary victimizers in the research and development field. Research and development funds are high risk capital invested in achieving major technical breakthroughs and adding fundamental knowledge to the state of the art. Fiscal budgeting in this area can and has resulted in waste of funds without achieving the sought for results.

Lesson From History

The development of separate agencies has become such a vastly expensive and technically complex adventure that it is no longer possible to achieve a any genuine results without holding steadily to a program chosen over reflexively long a period to allow new weapons to migrate from research and development into production and operational use. The history of the post-war decade has indicated that the people of this country appear to understand this fact better than their political leaders.

In the pre-Korean era when President Truman declassified the 70 primary Air Force program and held USAF to 48 combat groups, the Republic controlled Congress backed by popular support fought bitterly for an adequate airpower program. Now in the post-Korea era we face the same situation with the Congress willing to support an adequate airpower program in the face of a grave Communist threat and the executive branch of the government apparently convinced that we can survive with less airpower.

We should learn something from history.
—Robert Hertz

In the Front Office

Matthew James Leonard, vice president commercial relations, Ryan Hq. Company, Pasadena, Calif.

Charles C. Ross and H. W. Davis, vice president, Aerojet General, Northridge, San Ramon, Calif.

Alan C. Morgan, vice president-commercial, Northrop Design, Northrop Aircraft, Inc., Van Nuys, Calif.

Reg. One Leland W. Miller (USAF), military vice president-finance, Thompson Corporation of Calif., Culver City, Calif.

Kenneth W. McCann, vice president, SPACOR Corp., Dallas, Tex.

John J. Conway, manager, Westinghouse, 20 C. Office, Elmer, Northrop Design, Elmer, Massachusetts, Co., Danvers, Calif.

De Ann Wilkinson, special technical director to the president, Research and Advanced Development, Northrop Aircraft, Van Nuys, Calif.

Robert N. Buck, special advisor (jet engine program) to the president, Ryan Aircraft, Inc., Van Nuys, Calif.

Whitney Collier, executive assistant to the president, John A. Sweeney Co., San Diego, Calif.

Edward Kohn, assistant to the president, Wyle Laboratories, El Segundo, Calif.

Honors and Elections

Jean Belhomme, president and director general of Societe Nationale d'Etude et de Construction de Motors (SNECMA) has been elected president of the Union Syndicale des Industries Aeronautiques, Paris, France. Georges Glaser, retiring president, and Marcel Bismuth, vice president, have been appointed honorary joint directors.

The Motor Company, of Baltimore, Md., has been named recipient of the John F. Kennedy Award of the Franklin Institute of the State of Pennsylvania "for recognition of its extensive research, development and manufacturing of turbojet structures."

Dr. Dean Allen Watkins of Northrup Corp. has been named recipient of the HRT Lifetime Achievement Award of the Southwest Region, Institute of Aeronautical Engineers for "his long contribution in reducing noise in aerospace aircraft tubes."

Changes

Clifford A. Pratt, director industrial services, Consolidated Electronics Corp., Pasadena, Calif. Also Robert D. Bellinger, manager sales operations.

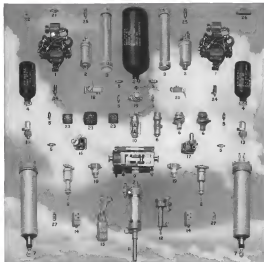
R. W. Schaefer, general manager Electronics Tube Division, Westinghouse Electric Corp., Elmira, N. Y.

Ken P. Day, chief development engineer, Raytheon Systems, Dallas Electronics, Inc., Dallas, Texas.

R. D. Murphy, export manager, Canadian Steel Improvement Limited, Toronto, Canada.

Kenneth M. Miller, manager engineering, Los Cal Motors, Inc., Santa Ana, California.

(Continued on p. 114)



Here it is—all the hardware needed for an all-pneumatic aircraft. All the items shown are pneumatic system components on the new Fairchild F-27, and open the door to an exciting new era of aviation. Another pneumatic equipment is now available from Kidde on an off-the-shelf basis, and modifications to your own specifications or design requirements are available through Kidde's vast creative engineering department. Let Kidde engineers show you how basic operating, lighter-weight pneumatic systems can better solve your power problems!

- | | |
|---------------------------------|------------------------------|
| 1. Compressor | 19. Valve, emergency brake |
| 2. Airline, emergency | 20. Valve, emergency landing |
| 3. Electrical valve | 21. Valve, emergency landing |
| 4. Air to air | 22. Valve, emergency landing |
| 5. Control valve | 23. Valve, emergency landing |
| 6. Pressure reducer | 24. Valve, emergency landing |
| 7. Airline, main line | 25. Valve, emergency landing |
| 8. Airline, all line ends pipe | 26. Valve, emergency landing |
| 9. Airline, new wheel | 27. Valve, emergency landing |
| 10. Valve, main line piping | 28. Valve, emergency landing |
| 11. Airline, main line | |
| 12. Airline, all line ends pipe | |
| 13. Valve, pressure filter | |
| 14. Valve, wheel valve | |

*Items 1 to 4 designed in cooperation with and furnished by Kidde Division of Fairchild

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INDUSTRY OBSERVER

► Total USAF investment in North American Aviation Inc.'s Navaho atmospheric cruise missile (AW July 15, p. 29) will be approximately \$600 million by the time contract finalization is completed. Remainder of complete Navaho system, including booster rocket and target cruise vehicle, probably will be less than half a dozen but these will be high (AW Aug. 5, p. 26).

► De Havilland Propellers Ltd. has a contract for a British intermediate range ballistic missile. Test bed, apparently with testbed for liquid oxygen, is visible at De Havilland's Hatfield plant.

► Aerojet and Alliant are combining forces to develop and produce a powerplant for a Mach 5 class commercial transport.

► Boeing and Douglas are studying possibility of using Curtiss-Wright T35 turboprop engines in downstream versions of their DC-10 and T77 transports (AW Feb. 21, p. 48). Advantage is that efficient cycle of T35s are present out of the small jets, which were originally intended for domestic use only, on low traffic density overseas routes.

► Photographic data showing the exact sequence of Lockheed X-7 supersonic jet vehicle tests have been obtained by using combination of airborne and ground cameras. Each wing pod at X-7 aircraft three engines Lockheed Navaho Division also has developed combination procedure whereby its many fire cameras can be aimed to monitor each occurrence of the firing sequence.

► Republic Aviation is investigating De Havilland's Gyron engines as a possible preconcept for NATO versions of its F-105 fighter-bomber. USAF versions are powered by a Pratt & Whitney J75.

► Several companies are competing in an Army design competition for a helicopter transmission system. Theoretical, analysis will work of any impending transmission failure to allow longer periods of use between overhaul and provide a safety factor so that transmission can be used on an emergency basis after it is due for overhaul.

► Hines Manufacturing Co. has developed equipment for USAF for detecting and recording data from the operation of rocket and turbojet engines at ultrahigh long distances.

► Thrust of De Havilland's Spectre rocket engine can be boosted from its measured thrust of 3,000 lb. to 10,000 lb. with minor modifications. Spectre will be produced in constant thrust assisted takeoff unit for the Avro Vulcan and Hawkeye F4 Phantom fighters. Variant bombers are equipped with Super Spectre units.

► Vertol is testing VTOL, probably will make its first test flight this week as well as the company maintains its present schedule. Test and further hovering tests have been made in open at Philadelphia's Municipal Airport.

► Rolls-Royce and Vickers Armstrongs are collaborating on a new vertical thrust aircraft that is an outgrowth of Robt. Young Rebound development.

► An F-105 has awarded Republic Aviation an additional \$10 million to continue the test program of its F-105 fighter-bomber.

► Recent Army tests employing B-54 and B-57 B-57 helicopters to transport the Little John ground-to-ground missile at White Sands, N. M., was hampered by altitude-density of the area and darkness. Army is now considering that pilots be provided data on loss of lift due to high temperatures and solving for better night-vision techniques.

► Royal Canadian Air Force opens have taken delivery of its modified Canet B-1 jet transport equipped with the new and different engine. Modifications, although costly, amount to less than \$500,000 and improved high speed landing characteristics.



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high-altitude and missile inverters

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INVERTERS - 480-CYCLE OUTPUT										
Type	Watt	Appl.	Watt	Appl.	Watt	Appl.	Watt	Appl.	Watt	Appl.
1000	100	1	100	1	100	1	100	1	100	1
2500	250	2	250	2	250	2	250	2	250	2
4000	400	4	400	4	400	4	400	4	400	4
6000	600	6	600	6	600	6	600	6	600	6
10000	1000	10	1000	10	1000	10	1000	10	1000	10
15000	1500	15	1500	15	1500	15	1500	15	1500	15
20000	2000	20	2000	20	2000	20	2000	20	2000	20
25000	2500	25	2500	25	2500	25	2500	25	2500	25
30000	3000	30	3000	30	3000	30	3000	30	3000	30
35000	3500	35	3500	35	3500	35	3500	35	3500	35
40000	4000	40	4000	40	4000	40	4000	40	4000	40
45000	4500	45	4500	45	4500	45	4500	45	4500	45
50000	5000	50	5000	50	5000	50	5000	50	5000	50
55000	5500	55	5500	55	5500	55	5500	55	5500	55
60000	6000	60	6000	60	6000	60	6000	60	6000	60
65000	6500	65	6500	65	6500	65	6500	65	6500	65
70000	7000	70	7000	70	7000	70	7000	70	7000	70
75000	7500	75	7500	75	7500	75	7500	75	7500	75
80000	8000	80	8000	80	8000	80	8000	80	8000	80
85000	8500	85	8500	85	8500	85	8500	85	8500	85
90000	9000	90	9000	90	9000	90	9000	90	9000	90
95000	9500	95	9500	95	9500	95	9500	95	9500	95
100000	10000	100	10000	100	10000	100	10000	100	10000	100



Washington Roundup

Soviet Missile Threat

Soviets could launch effective strikes against the majority of U.S. troop concentrations and missile complexes in the Far East from mobile bases they are believed to be building along Peter the Great Bay near Vladivostok. From these sites, intermediate range ballistic missiles—check the Russian name listed as quantum—could blanket Japan, Okinawa, Iwo Jima, South Korea and a large portion of Formosa. Launch major U.S. Far East missile complex, the 1,400-mile range is in the Philippines. Nine percent of missile sites also could be used as Soviet "big stick" to force Japan away from its foreign policy alignment with the U.S. Most of Peter the Great Bay has been closed to foreign ships and aircraft since July 30 despite U.S. protests that such of the area has no international status.

U.S.-Soviet Satellite Meet

U.S. National Committee for the International Geophysical Year is considering plans for a meeting later in October in which Soviet and U.S. scientists could exchange views and solve problems of satellite and other IGY research programs. Russians so far have been more close-mouthed about their satellite programs, following Soviet pattern of emphasizing only national ventures and saying the endorsement satellites cannot be an endorsement of goals that later are not reached.

Army Coup

Since the Force command, instead of political, Army has assumed through political press reports on rights of its mobile test vehicles, are considering if USAF shouldn't assume its Lockheed X-17 test vehicle the "Air X" or "X-17"?

Latest Army coup news suggests that, using jet-like launch, a major technical breakthrough in long range ballistic missile development with the first concept of the "re-entry" problem. Tests are that the vehicle was not a fighter but a test vehicle, and thus was not the first concept of the vehicle. X-17 test vehicle had several major tests (AW Aug. 12, p. 68) before Army test vehicle was first. One account of the report Army firing said the rocket traveled 12,000 miles. More accurate accounts said 1,200.

Military Pay Raises

Reformers of congressional opposition to the plan to reduce the military pay system, giving new compensation incentives for merit and skill, developed during testimony last week in Ralph J. Carlin's, before a Senate Armed Services subcommittee. Carlin, president of General Electric Co., headed the Defense Advisory Committee on Professional and Technical Compensation which made the proposal (AW Feb. 6, p. 17).

Senators raised the question that under the Carlin plan the military services may be confronted by these alternatives: an imbalance of high ranking officers or a shortage of low and middle-ranking officers. Two points developed by Sen. John Stennis (D-Miss.) chairman of the subcommittee, and Sen. Thomas Dodd (D-Conn.) chairman of the committee (AW Feb. 6, p. 17).

Under the Carlin plan, Army and USAF officers would receive no pay increase. For higher categories the increase, as a percentage of present salary, would amount: second-lieutenants, 1% wages; 12% lieutenant colonels, 11%, colonels 47% brigadier generals, 18%, major generals 39%, lieutenant generals, 49%, generals, 57%. Carlin said the incentive for the low ranking officers in this as the service would be the prospect of rapid promotion for ability. Stennis plans to give stronger bonus consideration to awards of the service pay as two times more than the covering of the new bonus act Jan. 1.

Pilot Survey

First limited survey indicates USAF's tightening of pilot training programs may have the desired effect. Until recently, pilots spent three-quarters of their year both in flight training, and too little operational time to be of much use and then returned to civilian life in great numbers (AW Aug. 19, p. 25).

New order effective next month, reducing pilots in first four months of training and Air Force ROTC members. Service among 100 trainees in first four months of training showed that 141 will quit rather than sign for five years, 166 will continue program.

'Constructive Contribution' Out

Long standing requirement that military information must "constitute a constructive contribution" to Defense Department's mission in order to be releasable has been abolished, but Assistant Secretary of Defense for Public Affairs Marion Sander was here "missing and absent" of Pentagon information policy remains unchanged. November 1964 directive (DOD 100-10) was based on a "positive step" by the House Government Information Subcommittee Chairman John E. Moss (D-Calif.). Although it requires review for defense policy and national security impact as well as for accuracy, it also reflects that positive attitude: "Nothing in this directive shall be deemed to indicate the refusal to clear material, other than releasable, because its release might tend to reveal administrative error or inefficiency."

Civil Aviation

Outlook is that at least two measures to avert local service carriers with their re-organization looming will be enacted by Congress this session. These measures:

• **Reauthorize Civil Aeronautics Board** to grant a permanent guarantee of 90% on losses up to \$15 million to local airlines. Alaska, and Hawaii lines for the purchase of equipment. Two U.S.-Alaska carriers—Alaska Airlines and Pacific Airlines—and two Canadian carriers—Canadian Airlines Atlantic and Alaska Airlines—will be eligible. Minnesota passed the House 248 to 94 after being approved by the Senate 72 to 50. Only issue between the House and Senate remains is whether metropolitan helicopter lines also should be included, as provided in the House.

• **Reauthorize Financial Institutions** to offer financing by granting them rights over the aircraft equipment financed as part of bankruptcy. Measure has been approved by both House and Senate Judiciary Committees.

—Washington staff

Industry to Get Key Missile Logistic Role

Air Materiel Command's 10-year program will tie industry to world-wide communications system.

By Claude Witte

Wright-Patterson AFB, Ohio—Air Materiel Command's 10-year program to provide logistical support for USAF missile units calls for increasing private industry.

Weapon system prime contractors and the makers of critical components will be tied into a new world-wide communications system that will feed both data and hardware to the Weapon System Support Manager (WSSM) Aug. 19, p. 20.

An outlined by Maj. Gen. Kenneth T. Tibbitts, AMC director of plans and programs, improvements and additions to the management pattern in the next decade will include:

- Truly global logistical command to regional level weapon system support lines.
- High speed communications system for the rapid transmission of logistical information.

- Electronic data processing capability to provide timely and effective tactical management and the fastest possible reaction to customer demands.

- High speed transport capability to complete the dynamic circle of the logistic system support.

Assignment of support responsibility for a system early in its life for Air

Materiel Action, accomplished that summer, was the first step in a program to establish a strategic pattern of Weapon System Support Manager to deal directly with combat units anywhere in the world.

Next step, it is anticipated, will be a communications network linking the WSSM to its customers. In addition, the WSSM will be supported by industry through extension of the communications system.

There will be communications links "Gen. Tibbitts promises, "to all the elements of the logistical system, both military and industrial, that provide the support manager the resources for maintaining his weapons. These communications links will be designed and developed for the purpose of transmitting logistical type information."

Long-Range Program

Conformance with prime missile contractors and representatives of the Aircraft Industries Association have been started to work out a long-range program for selection and installation of the equipment necessary to do this job. Not all of the manufacturing and data processing capability has been developed, and the manufacturers of this equipment still face a new challenge in AMC's 10-year program.

One problem is the situation may be that the industry will install this equipment and take part in the AMC logistics program at its own expense. AMC, in turn, partly to help USAF users. And the question will be raised about a reduced volume of weapons and spare parts.

Reduced Stockpiles

Distinctly reduced stockpiles will come as with full-scale missile war. The specialized stockpile depot and the common depot will be phased out of the picture.

Gen. Tibbitts has explained the situation in terms of the smaller missiles. Missiles as the GAK family—such as Talisman and Silvermaster—have more than 5,000 parts each but have no constant "go" or "no go" checks that result in replacement of faulty mass, sub-components.

"The biggest trick," says Gen. Tibbitts, "is to get the right kind of stockpile to adequately replace a malfunctioning missile with a good one and bring the old back back to a general hospital for treatment."

"We've got to get up to fix these racks on the spot and save all the rack and tooling and test equipment for this mission. It's not just over 50 million. We can't afford that at every military base."

"Then we can't build a few hundred units back and get each one a few years to us in our rear at a time. We're going to be looking at the little piece of rack and tooling. Do they give the answer. We must live as few as we can and keep the stock base to a minimum program."

In the case of the member IREX and KCMX type, AMC proposes to bring missile test drive equipment forward to the launching site. Only one process will be conducted for overhaul and modification. Again, this base objective will be to buy as few as possible and keep even the supply of spares down to a level that will assure new economies.

Secret of the system will be in improved communications, faster processing of data and high speed delivery, all of the way from the manufacturer's plant to the combat-ready unit.

A great deal of the planning for this logistic condition may come from the Logistics Laboratory of the Rand Corp. in California, where the staff today is conducting simulated exercises and figuring out what speeds are needed in accelerating launch, payload and such factors and transportation.

The transport system will not call for



Soviet Airborne Tanks

Airborne tanks of the Red Army are parked publicly in Moscow. They are armed with a 57 millimeter high velocity gun and can be dropped by parachute or airlifted in new Red Air Force helicopter assault transports such as the An-6 and An-26 and in large helicopters such as the two rotor Yeh-24. Note the parachute-landing gear on the side.



Navy's First Nuclear Carrier

Navy's first nuclear powered carrier will have a 74,500 ton standard displacement, 4,400 ft length, 215 ft hull beam, 180 ft in more deck space than USS Zumwalt and 1,800 sq ft more hangar deck space. Newport News Shipbuilding and Drydock Co. of Newport News, Va., will begin building it that fiscal year. Cost will exceed \$500 million. Eight nuclear reactors in tandem pairs will power four steam and four diesel will drive 15 shafts. CVN-65 will be able to conduct an operation for at least 3 days, compared to 15 days for conventional carriers, before most ships become nuclear powered, and for 12 days in more after that. Elimination of smoke allows operations of a new high performance ship which will give greatly greater detection range and is kinder to port. Lack of stacks also decreases chance of infrared detection, with constant and change coastal problems, says Tibbitts. Navy's Ford 198 program also includes construction of an guided missile cruiser, three large nuclear powered missile submarines, for missile destroyers and conversion of three cruisers to city destroyers.

have left as much as it will for high frequency. By today's standards, search for the Lockheed C-130 and Douglas C-119, among with something that approaches shorter service, probably would be able to answer most of the demand.

As electronic data processing is expanded, and experience provides better processing material it is contemplated that spent requirements for a particular combat unit and in the shop side of a Weapon System Support Manager can be anticipated and those put in the pipeline without a significant spending over the years.

Many problems in perfection of the system lie, of course, in the dependent status of the demand and the corresponding combat piece of technological change. An integrated data system that will "think" about these factors and make allowances for them will be a major achievement for AMC management.

Gen. Tibbitts says the Weapon System Support Manager must have a data processing system that will receive, all get and analyze all logistical information from all over the world. He anticipates that the WSSM will be able to find out how many missiles are ready and all data, how the data is being handled and how much more time is

needed and where, how many people are needed and what transportation is required for any purposes in the field of missile responsibility.

Mixed Inventory

It should be able to determine all that is about a stock, in addition to a change in inventory in the process, he should be able to find out quickly how feasible the change is in terms of military and equipment support.

Newbury's Successor

As published by Aviation Week (AW) Aug. 1, p. 214, Westinghouse recently announced that P. D. Froese has been named to succeed Frank D. Newbury as Assistant Secretary of Defense in Research and Engineering.

A former executive vice president of Gulf Research and Development Co., Froese has managed his own consulting firm in Washington since 1951. Newbury left the post after conducting over an attitude toward research and development (AW Aug. 29, p. 21).

Froese also wrote the joint report last fall last week, before the Senate Armed Services Committee who has been serving on the National Research Council of the National Academy of Sciences.

Gen. Tibbitts and his staff are mandated of the fact that USAF will have a mixed inventory—conventional and nuclear—until for some time to come and that the transition to a new system must provide adequate support for both types of weapons in the intervening years. For this reason, the changes already has been started on the Cowley Series lighters.

Says Gen. Tibbitts, "The delivery network of our tanks that will drive from the core largely of weapons is determined basically by a single test—a missile, whether it is large or small, is an assumed constant." It has all the components, an engine, a propulsion system, a guidance system, provisions for carrying a destructive device and an array of ground support equipment.

"All these systems have changed in radically, however, that the principle of logistics regarding nuclear missile weapons systems must be drastically modified."

It probably is true that more from the impending revolution in nuclear launching techniques, the most drastic changes that be ahead for the aircraft industry will result from its integration into the AMC logistic complex, on a scale that was considered impossible and impractical before the missile era.



B MA7, designed for supersonic system and now equipped with twin stabilizing booms, poised for launching from supersonic sled displacing General Electric rocket (left). Shot several times, B seat against water area rocket (right) (left).



Booms Stabilize Supersonic Escape Seat

New B seat for supersonic system that substitutes telescoping booms and free for stabilizing rocket and horizontal stabilizer (AW May 2 p. 94) in element a roll-on, coupling system concept used with the old model seat has shown excellent stability characteristics during tests on a supersonic truck.

B seat, developed for USAF's supersonic system fighter, status first work done by the Johnson Creek Range Systems Committee. General (Jim) Dugan is chairman of the 11-member committee of aircraft companies and

subcontractors who work with Air Research and Development Command to perfect a safe system for supersonic aircraft.

Tests are being conducted at AEDC's Supersonic Military Air Research Truck, Hagerman Mesa, Utah, by Columbia Engineering Company, Inc.

On the first successful test, a full-scale dummy seat installation was mounted on a Canavia F-101A cockpit sled in a knee-to-chest, feet first, upright position.

Seat was ejected by rocket from the

sled while it was traveling at supersonic speed.

Seat rose about 180 ft, sailed smoothly close to the water's edge, and floated safely to the canyon floor 1,500 ft below as a parachute which had been deployed at the proper moment opened and seat was undamaged.

Control techniques are that dummy was subjected to an acceptable GDC, as determined by the seat's rocket and road blast deceleration was quite low, well within the limits of human tolerance. Average chest pressure was exactly half that of which a pilot, seated in the normally upright position in a conventional seat, would be exposed, General said.

In the first half of its trajectory, the boom-equipped B seat made only a quarter of a turn. Complete 180-180-180 ft flight was made with only a half turn. Many observations simultaneously visible and have been achieved.

The twin booms with flaps at the back serve to stabilize the seat much in the same manner as an elongated fuselage which supports an empennage, elsewhere a plane.

The booms support air four sections each for storage in a small space. They are extended by internally stored explosive cartridges. The fourth, or top, section of the boom extends spring-actuated but which pop out in seconds in the fourth section of the boom as positioned.

New trials, to be conducted this fall, will evaluate the complete system cycle of raising the seat to the upper



ROCKET-PROPELLED B seat rocket quickly down seat at about midpoint of its 20,000 ft flight. Shot last extended 90 deg from its launching unit.



position, extension of telescoping booms and free and separation of dummy from seat.

AEDC assigned Lockheed Aircraft Corp. a parallel responsibility for developing a downwind supersonic cockpit system.

Rohr to Hire 2,300 for Production of 707 Fuselage

Rohr Aircraft Corp. will hire 2,300 new workers in the end of the year to handle production of fuselage sections for the Boeing 707 jet aircraft which will be manufactured from Boeing Aircraft Co. in Seattle.

Personnel announced that a new higher production rate to be reached on the KC-119 fuselage, together with fuselage sections on other major Boeing programs, will affect any reduction in work force.

Rohr confirmed that it has received an order under the approximately \$115 million from Boeing for 40th fuselage section.

A30s Fly Hawaii-U. S. Nonstop Without Refueling

San Francisco-Four A300 Superjets, carrying four major qualifications, flew from Boeing Point, Hawaii to a point over San Francisco International Airport in times ranging from 4 hr. 12 min for the first to 4 hr. 18 min for the last two and 4 hr. 18 min for the last.

A300 was first North harbor planes in the shortest and without refueling so this particular route, according to spokesman at Alameda Naval Air Station.

Firm's Right to Unexpected Profits Is Heart of GM Controversy

By Katherine Johnson

Washington—A manufacturer's right to unexpectedly high profits under a fixed-price type contract is the heart of the controversy over an alleged \$17 million in "extra profits" by General Motors Corp. on a \$175 million Air Force contract for 599 F-4E jet fighters.

The change of the contract profit was made by General Accounting Office in a comprehensive report and passed up by the House Armed Services Investigative Subcommittee (HWS July 29 p. 21).

The results were produced at General Motors' Buick Oldsmobile Pontiac Assembly Division, Warren, Mich., between 1951 and 1955.

'Phantomal Job'

The main reason for the high profit, it was developed in testimony, before the subcommittee last week, was that General Motors completed the deal and built against the contract for an advance of the potential schedule. "They did a phantomal job," U.S. Gen. W. Thompson, chief of Air Material Command's Pricing Staff Division, told the subcommittee. "They performed and delivered the profit."

Mr. Gen. William T. Thompson, deputy director of procurement and production at AMC, explained that "it is of greater benefit to pay a contractor 5% of profit in an overall price

of \$10 than 5% of profit in an overall price of \$11."

Previously, General Motors received a profit of 31 1/2% before taxes, 5-6% after taxes. The three-year contract was twice reestimated. Noting that the profit rate of the major airplane manufacturers averages only 3%, with a range from 2.4% to 5.6%, Subcommittee General John Courtenay said that the much higher profit on the General Motors contract attracted the attention of the subcommittee and General Accounting Office.

GMI's Reply

John F. Courtenay, General Motors vice president, strongly defended the company's performance and savings and testified that he felt "no legal or moral responsibility for a refund of any part of the \$17 million alleged excess profit."

Rep. Edward Hebert (D-La.), subcommittee chairman, and Rep. Porter Hodge (D-Va.) charged that at the time of the final determination in March, 1955, General Motors was aware that it could accelerate its schedule and complete the contract substantially before the planned wind-up in July.

The contract was finished in May. Air Force representatives acknowledged that all required sub-components were at the Keesee City facility at the time of the March negotiations and "it was



CRASHUP of new B seat shows dummy in upright, forward position and low position, side winging 1 ft stabilizing boom, ends of which mount seat strong for



Automatic Landing Tested on Carrier

Automatic landing system developed by Bell Aircraft Corp. is tested by Douglas F4D Skyhawk aboard carrier Admiral in flight operations off Pensacola, Fla. Radar system directs F4D to determine its altitude and position as relation to carrier deck. Then computer sends necessary course corrections to intercept an aircraft and bring the airplane onto touchdown with pilot virtually a passenger. Navy requires system load on plane within plus or minus 10 ft long tolerance and plus or minus 25 ft laterally at a predetermined landing spot on deck. Carrier Simulator Section of Flight Test Division at the Naval Air Test Center, Patuxent River, Md., is conducting tests. Guidance and control units can be seen below.



EEMCO AC and DC Motors

Because in missiles and jet
aircraft everything has to work the first time
have been chosen for use in the majority
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Type C-16H 400 cycle 3 phase AC Motor with Duct. Weight: 9.5 lbs. Voltage: 200 volts. Output: 1500 watts. Maximum RPM: 17,200 rpm. Meets Military Specification MIL-M-17618A (300).



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Type D-102 400 cycle 3 phase AC Motor. Weight: 17.5 lbs. Voltage: 200 volts. RPM: 4.5 to 250 rpm. Duty cycle: 2.0 seconds at 4.5 to 250 rpm. Maximum speed: 4.5 to 250 rpm. Meets Military Specification MIL-M-17618A (300).



Type D-102 400 cycle 3 phase AC Motor with Duct. Weight: 17.5 lbs. Voltage: 200 volts. RPM: 4.5 to 250 rpm. Duty cycle: 2.0 seconds at 4.5 to 250 rpm. Maximum speed: 4.5 to 250 rpm. Meets Military Specification MIL-M-17618A (300).



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AIR TRANSPORT

AMB Plans Full Operation by November

Three-member board will have staff of 60 to aid research program to untangle traffic bottleneck.

By L. L. Dett

Wellington-News continued: Airways Modernization Board is expected to launch a "pilot project" within 60 days to handle the long range, full scale research and development program designed to untangle the nation's air traffic bottleneck.

A White House spokesman admits the first estimate is "on the optimistic side" but adds that having an interim staff of 60 is "on the optimistic side." The program proposed by former presidential aide Edward C. Carter (AWM No. 20, p. 25) should be in full operation no later than November. Staffing of the three-member Board is planned to begin immediately after development and research have been written in a Civil Service Commission report on personnel management.

AMB Organization

Initially, the Board will consist of a staff of approximately 60 people with five members drawing \$30,000 annually and 20 members being classified in the "upper grade" category which only has between \$13,000 and \$17,000 each.

The Board will be administered by a three-member group consisting of the chairman and the secretaries of defense and commerce. A meeting of the three will be held shortly at which time it is expected that the secretaries will name delegates at the cabinet secretary level to represent them on the Board.

Operational pattern of the interim board is being outlined in a group of 25 memoranda representing the military services, Civil Aeronautics Administration and civil aviation. Assigned to the AMB as a temporary base for a period of 18 to 90 days, the special consultants are working in task force groups to lay out an operational structure for the Board during the next year.

The Airways Modernization Board became a fact earlier this month when President Eisenhower signed the bill that gave the Board legal status as an independent agency (AW Aug. 19, p. 15). Later, the Senate unanimously confirmed the nomination of former USAF Lt. Gen. Edward Quesada as chairman of the Board. Quesada will serve as the final link of Board chairman and as special assistant to the president for aviation facilities.

The Board was proposed by Edward Carter in his final recommendations to

the President as an interim means of research in handling the nation's air traffic control problem.

Although it is now an independent agency, the AMB will be absorbed by the permanent independent Federal Aviation Agency when it is established sometime within the next three years. In passing the Airways Modernization Bill, Congress called for a report with recommendations on the establishment of the Federal Aviation Agency by Jan. 31, 1959 (AW Aug. 1, p. 23).

End to ANDE

The Airways Modernization Board will be the end of the Air Navigation Development Board which was originally organized in 1949 and reorganized in 1951 to handle research and development of air traffic control facilities. ANDE will be completely absorbed by the AMB and it is expected that most of the ANDE staff will be transferred to the new Board.

AMB staff currently consists of five full time members. An additional 25 persons are assigned to the AMB in other agencies. Two groups, a system engineering advisory team and an operational advisory team, complete the organizational structure of the AMB.

Each of the teams is made up of one representative from the Army, Air Force, Navy and Commerce Departments.

AMB will take over all ANDE facilities and will move into the old Board's quarters at 705 G Street, Northwest.

Quesada's Task

ANDE funds, amounting to about \$4 to \$5 million, will be used to launch the AMB program. Additional funds will be transferred from Commerce and Defense to cover expenses during the balance of FY 1959 although a House of Representatives amendment to the Airways Modernization Bill that limits the President's authority to transfer funds from other agencies to the Board could require a special appropriation. AMB will have its own budget as of FY 1960.

It has dual role as chairman of the AMB and special assistant to the President on aviation matters. Quesada will be charged with the responsibility of naming the Board and laying the groundwork for the permanent Federal Aviation Agency.

He expects to submit a staff of about 60 people in preparing his proposals and recommendations for the engineering and operations of the permanent agency. Target date Quesada has set for the project is January, 1959.

As presidential aide, Quesada will



Lufthansa 1649A Deliveries to Begin

Lufthansa 1649A deliveries to Lufthansa German Airlines are scheduled to begin in October. Gates will receive four of the planes with last delivery set for January, 1959. This will be used on North Atlantic routes as a backup aircraft.

live in non-voting colonies of the Air Coordinating Committee which eventually will be absorbed by the FAA, set an agenda for the President on aviation matters and "generate leadership" as the establishment of the Federal Aviation Agency.

The entire program has received the strong support of civil and military aviation organizations and the Civil Aeronautics Administration. However, Civil Aeronautics Board chairman James Dill indicated during congressional hearings on the Airways Modernization Bill that he would be unwilling to recommend any of CAB's functions to FAA.

Under the Carter proposal, the CAB would retain economic regulatory con-

trol of the airlines and enforce route allocations, but would relinquish all aviation safety functions.

J. Gordon Bennett, who was associated with the William Barclay Wood group that failed the need for an improved service reform (AW) Jan. 16, p. 20, and the Carter group throughout the entire program, will phase out of the ANS process as the reorganization takes shape and serve as executive assistant to Quindici in his capacity as special assistant to the President. Bennett, a former airline and Navy pilot, was earlier associated with the CIA and later was assigned to the Commerce Department in various offices in the transportation bureaucracy.

Airlines Edge Into Mass Market, Survey Shows; "Pay Later" Lags

By Glenn Garrison

New York—Transatlantic scheduled airlines have begun to penetrate the potential mass market of average-income passengers, a Part of New York Authority survey indicates.

But transatlantic air travel still is largely for the well-heeled, the survey also shows. It covers the April/October 1956 to census and includes passenger transactions completed by 55,000 passengers on 450 flights from New York to Europe, Bermuda and Latin America.

Pay Later Apology

The strongly polarized pay-later plan to attract transatlantic passengers is a ripple in the transatlantic ticket sales, the survey shows.

Other highlights:

- Fewer than a third of the American transatlantic (to Europe) passengers were traveling for tourist purposes, but 60% of the American period covered. Most of those visiting Bermuda were tourists.

- Great majority of American transatlantic flights stay away more than two weeks abroad during their trips. The 11-day maximum here introduced last fall therefore would not be very useful to critics who contended the time was too short (AW Feb. 18, p. 5).

On the other hand, it may be creating a new market.

- About 40% of American tourists leaving New York to visit the ocean which includes Central and South America, the Caribbean and Bermuda were going only to Bermuda. The air market to other Latin American points would seem to be virtually untapped as it is dependent from New York are concerned (Panama-Rio and Miami are excluded from the survey).

- Travel agents provide the major and domestic carriers with a transac-

tion release of business continues. His influence seems somewhat on the waning, but he is the main force behind the plan in significant form.

- Transatlantic passengers traveling for tourist reasons on tourist-class flights are undoubtedly the largest traveling for other pleasure purposes, such as visiting relatives abroad.

\$30,000 Level

That citizens on hand is not yet everyone's pleasure is indicated by the survey finding that about 21% of all the American passengers had family incomes of \$30,000 or more, a level on the low end of the United States population. More than a third of the American traveling for tourist purposes were in the high income group.

About 20% of the American traveling for tourist purposes, however, reported family incomes of less than \$6,000. Seventeen percent of those tourists belonged to the \$5,000-\$6,000 family income group, representing 40% of the population. "Statistical portrait was at the \$5,000-\$6,000 bracket, making up 21% of the population."

An International Air Transport Association survey of the first five years of transatlantic tourist fare service noted last spring that figures which indicated a somewhat higher penetration of the mass market.

Age Groups

The report put 34% of all transatlantic passengers in the \$5,000 or less income bracket, and said 17% of the passengers had family incomes of less than \$6,000. The figures were based on a survey by age and sex.

IATA said it would not want to dispute the Part Authority figures which are based on a survey covering tourist and domestic carriers with a transac-

tion. IATA spokesman, who said that the current law hopes to look the cost of the mass market.

The Part Authority survey figures concerning age of passengers born out of the IATA report's contention that tourist class passengers are younger than first class passengers. The IATA report says that "include the most significant figure is all this mass of statistics, one finding that tourist class services have opened up to all younger people."

Tourist Percentage

Only 31% of the American transatlantic passengers surveyed by the Part Authority were going overseas for the first trip. Of all American transatlantic tourists, 31% were tourists at the time that tourism was the purpose of their trip. Of first class American transatlantic passengers, 19% were tourists.

"Other pleasure" purposes said more tourist fare tickets in Europe than did tourism, the Part Authority found. Forty-one percent of tourist class ticket holders were in this category, and 12% were in the personal affairs class of trip purposes. In comparison, 16% of the first class passengers were in "other pleasure" purposes and 8% were "personal affairs" travelers.

Transatlantic tourist fare service, it would seem from the above, is possibly depending less on the vacation market and more on the business market who are here and away for the year to visit a relative or the old country, or who have some other already existing reason for coming to Europe.

Business travelers made up 12% of the American transatlantic tourist class tourists, 21% of the first class passengers.

Purpose Trips

Among foreign residents, who come about a fourth of the total transatlantic passengers, only 10% of the tourist class sales were tourists. Forty percent were traveling for "other pleasure" and the percentage of return to relatives abroad was lower (22%) as compared to the first class.

On the Bermuda-Latin America flights, most tourist fare passengers—80%—were tourists in fact.

The United States, New York, "Pay Later" plan said a just planning is the Part Authority survey. Only 21% of American tourists reported use of the plan to finance their trips. Of tourists for all purposes, 41% and 40% for tourists for business and 21% for tourists for Latin America trips. Tourist residents made slightly greater use of the plan (21% transatlantic, 41% Bermuda-Latin America).

Most American transatlantic passengers who said pay-later (26%) were 41



Idlewild "Terminal City" Progress

International Airport Building and its adjacent wing buildings for long-term office at New York International Airport are under construction at right above. Ramp runs from airport through base of control tower in building. Opening date, proposed from July 31, has not been fixed by Part of New York Authority.

the \$5,000-\$9,999 income group. Surprisingly, 13% of the transatlantic passenger passengers reported family incomes over \$18,000. On the transatlantic route, 7% of the personal affairs (tourists) used credit, 5% of the status to relatives and 3% of the business passengers.

Survey Questions

The surveyed passengers were asked for information concerning the frequency of their trips, family income and interests, and where they usually bought their tickets.

Third agent services, the airlines industry, are said in a slowly declining way by American passengers as their number of trips increases. According to the survey, the agent sales 69% of first-trip tickets to Americans making their first or second flight.

From the first to sixth trip, the percentage is almost the same—48%. In the sixth to 24th trip, the percentage is 51%; in 25th and over, the agent accounts for 67% of sales.

About half of the transatlantic passengers surveyed were on their first or second trip; 34% were on their third or fourth trip; 24% were on their fifth or sixth trip; and 5% were on their seventh or eighth trip.

About two-thirds of the American transatlantic travelers spend more than four weeks abroad, the survey found, and 90% of these stay more than two weeks.

Average is about six weeks. Duration of trip at Bermuda and Latin America is shorter by one or two weeks for about three-fourths of the American travelers.

Among Americans traveling to transatlantic destinations for tourist purposes, the biggest group—35%—means less work.

Only 7% of the tourists consist only two weeks or less.

Importance of New York

Importance of New York to the transatlantic business was pointed up in the survey, which found that 60% of U.S. passengers on the route depart from here.

Approximately half of the Americans going transatlantic from New York had paid at least one of their destinations. London was listed by 44% and Rome by 15%.

The Part Authority survey also covered the off-season months, which will be analyzed in a supplemental report by the agency.

United's Custom Coach Plan Approved by CAB

Washington—Approval of a United Air Lines proposal to inaugurate custom coach service at three airlines together than regular coach service from has been recommended by Civil Aeronautics Board Chairman Fredrick D. Mann.

The airline proposed the service in DC-7 aircraft with six rows of three-above seats and a total capacity of 36 passengers.

Full coach seat widths will be served in the extra charge and passengers will be permitted to reserve seats on that basis.

Created in 1948, the DC-7 is only in the New San Francisco to New York in eight hours.

United last filed a mail proposal for a new service of \$102, \$1 higher than that for the present regular coach flights.

From New Chicago to New England, San Francisco and New York, or between Los Angeles and New York range from \$1 to \$3 higher than present coach fares on these routes.

Equipment, Routes Cripple Local Lines

By Ford Eastman

Washington—Lack of modern light equipment, strong route structures and present intercarrier methods are cited by local service airlines as main obstacles to achieving a new era.

These are problems which face the industry as a whole. On an individual basis, there are others.

A typical example is Trans-Texas Airways, which operates 178 airports, eight midwestern cities, Tulsa, Oklahoma, Louisiana and Tennessee. R. E. McKinghain, Trans-Texas president, has outlined his company's problems from the standpoint of equipment, traffic and operations departments.

One of the most acute problems, according to the airline's business development, is the misleading picture of the Civil Aeronautics Board's department claims that the public has prohibited the local service industry from expressing any record of profits and that the criteria used by the Board is that there is no such thing.

The role of airlines to carriers is now determined as a rate base equal to the original cost less book depreciation of the used and useful assets. This method is currently under consideration by the CAB in the State of Reform to Local Service Case. Local carriers generally must file of returns determined in accordance with this assessment.

In addition to the rate setting policies, Trans-Texas says the CAB could render a great service to the local service industry by handling applications for the new rates on an expedited basis. President McKinghain says.

Waiting Period

There appears to be no reason why following an application for a rate that the new rate could not be finalized within a 90-day period as compared to the present maximum time of one year, which in some instances has stretched out to four years, says McKinghain.

"Obviously," he added, "this type of procedure places more emphasis on the carrier and makes planning extremely difficult, if not impossible, impossible. We know of no other industry that is subjected to these stalling conditions while still being required to be extremely efficient and economical."

Last year, the domestic airlines, as alleged by many operating units, McKinghain points out that it is crucial that local lines be compensated approximately 50% of Trans-Texas' total and reduced costs and have contributed substantially to national industry, since passenger fares are regulated and cannot

be used to offset these higher costs.

"In addition to this," he said, "such as the form of landing fees and office rentals at the various airports we were have steadily increased. Local service carriers are often the victims of being required to pay machine landing fees while carrying only a small percentage of traffic."

As for route structure, the airline and the CAB should take advantage which require local carriers to make multiple stops between terminals. The airline advocates either nonstop or one-stop between terminals as well as points served enroute.

Trans-Texas Airways also would like to have the CAB adopt a more liberal policy toward permitting local carriers to suspend unserviceable points. At the same time it and airlines should be suspended from both ends and the carrier is also subject of a local carrier and the local carrier is prohibited.

Airport Problem

The airline's operations department summarized the current most pressing needs as lack of airports—airports, equipment, navigation aids and communication.

The airport problem is fast becoming a major one for the local service carrier," the airline said. "Cities are building larger and more elaborate facilities every day. With the advent of jet aircraft and the need for longer and stronger runways, increased loading areas, and special landing facilities, the major cities are going into a major period of expansion. At least part of this expansion will be based on local carriers as a result of the fact that the airports for the expansion is long range markets where the local service carrier cannot get in."

Trans-Texas says that in the smaller cities, and in some cases major cities, expansion of facilities has become a strong handicap to local carriers. Communication facilities, together with it is reluctant to enter into airport projects that would serve two or more communities. The airline said that, as one airline, where two cities were served 30 miles apart, each built its own airport, one 12 miles to the north, the other 12 miles to the north.

McKinghain and the airline's present DC-7 equipment was not designed to do the job. Local service carriers have to do.

"Our equipment should be substantially faster from block to block," he said, "capable of taking off very short, can take and land without a substantial delay to increased schedule, since passenger fares are regulated and cannot

be used to offset these higher costs. The last is a concept long recognized by short-haul service carriers who have peak segments and peak hours. Their equipment is designed to provide for peak loads up to 195% increase in capacity with the same equipment."

"Perhaps the same concept could be used to advantage in our industry by using combination high-passenger aircraft which could be immediately converted to all passenger configurations," he added. "All of this is based on the possibility that manufacturers will actually look at one operation, study our needs and give us a piece of equipment that meets these needs in a compromise which only accident the airline."

Navigation Aids

The airline and the navigation aid problem is one that has plagued the local service industry since its inception. If a navigation facility does not exist at a point the carrier serves, the last must either put one in at its own expense or else rely on the government.

Airlines, controlled airports, control towers and other facilities do not exist in many areas, McKinghain claims. Improvements to the system must have been based on the long haul airline which has more routes and facilities to choose from, while the local carrier must run a gamut of an air traffic control and navigation aids. He said that federal authorities apparently do not recognize this hazard because they do not control the area and that they have no statistics for the problem.

Aeroline problem of the operations department, the airline said, is the high cost of administration in a regulated industry. "The requirements of reports, reports, and procedures which must be completed," the department said, "point up this problem as an expense due for technological improvements."

In addition to suggestions by other departments on how to best control to become self-sufficient, the Trans-Texas traffic staff recommends a reduction in volume, ground operations and traffic expenses through an efficient utilization of ground personnel and facilities.

Ground costs are, according to the traffic department, about equal to flight costs on U.S. domestic routes. In actual practice with short-haul carriers, the costs usually are greater than half of the airline's revenue plus fuel cost. The department said that ground costs and other costs would be reduced through greater flight efficiency.

gency of existing stations. With a greater frequency of flights at existing stations, an airline can handle more passengers and provide of cargo jet, explosive, ticket counter, stable expense unit and square foot of verted space.

Western Air Lines of Los Angeles, New York, points to route strengthening and acquisition of new airline equipment as the two main steps on the road to industry-free operation.

Edmund Converse, Western president, says that, with the coming of jet and helicopter equipment, the trunk airlines will have more opportunity and desire to be expanded at their marginal and intermediate stops. Local carriers can be strengthened by adding many of these cities to their systems.

Converse and trucklines are now reluctant to give up intermediate points that are good traffic producers from a local service point of view, but which the truckline might find unsuitable in the coming jet age. However, he said, the local carrier should be strengthened by adding these connections to their system.

Passent routes, he adds, can be strengthened by the issuance of stop-stop authority for all flights in routes of two round trips daily to intermediate points. The better the timing of such restrictions would not have trucklines but would improve service to those that require it.

However, which has advised President Dwight D. Eisenhower to propose the DCA, is a strong basis on passage of the Governmental Bill to Congress in order to obtain the necessary financing to purchase the planes.

A somewhat similar situation was outlined by North Central Airlines of Minneapolis, Minn. Hal N. Cox, president said he could not go to work in the industry, it is due to local airlines that will have a greater impact at less cost per service and it is the same time mobile the airline to offer the faster, more comfortable, more reliable air service. Thus, the CAB added, airline manufacturers have been reluctant to develop a suitable DC-7 replacement for the local industry, largely because of its extensive maintenance requirements.

"Improvements in route structure would also materially strengthen the local airlines," Cox said. "Longer haul authority on selected routes would be extremely beneficial to help offset the great losses incurred at the smaller points. Moreover," he added, "this is not to suggest that we would like to see any way to depart from the local service of operation. Our industry, however, we are now and will continue to increase service steadily to our present smaller cities and add more small stops."



Constellations for Three Airlines

Two Lockheed L649A Constellation, planes colored by the Western and Eastern, are parked in front of a terminal building. In background is a large airport terminal for delivery to National Airlines for New York-Miami service.

Realistic Schedules Ordered by CAB

Washington—Civil Aeronautics Board last week ordered domestic airlines to complete at least 75% of their flights within the elapsed time shown in their schedules.

At the same time, the CAB defined action on the proposed carrier departure and arrival time would allow an evaluation of the elapsed time requirements.

The Board's action followed action in Air Line Pilot Association, which has asked airlines publish schedules for flights that are "realistic" and cannot be completed as fast. The Board originally proposed to require each airline to report its percentage compliance to one point at least 75% of scheduled flights on test in the absence of intercarrier factors beyond the carrier's control. If this was not done, the Board would have required the airline to accept its schedule restrictions.

The new regulation defines as that 75% of all flights must be completed within 15 minutes of the block to block, not shown in the schedule on the basis of three individual minutes instead of one. Also, anytime departure and arrival performance is not part of this regulation. The CAB said the new regulation does not apply to helicopter operations or to all-stage flights. Carriers will make realistic reports of flight delays in the CAB. The reports will be analyzed for flight time reductions and for determining whether the Board should adopt an on-line performance regulation.

In explaining the regulation, CAB said flight delays which experience shown will be assessed, and it is concluded by air carrier on scheduling flights. However, these delays caused by conditions beyond the carrier's control and which could not have been anticipated by the carrier, are not subject to penalty. For example, in-flight delays, which could not have been anticipated by the carrier, are not subject to penalty.

Nevertheless, the CAB added, as a carrier should be able to plan its operations to ensure that 75% of the flights should be able to complete within 15 minutes of the block to block, not shown in the schedule on the basis of three individual minutes instead of one. Also, anytime departure and arrival performance is not part of this regulation.

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Mach 2 Transport Urged for British

London—Development of a 1,700 mph 55-engine jet transport and nuclear-powered super cargo aircraft has been urged on the British aircraft industry in a special memorandum set up to study the possibility of Britain's jet transport policy.

The group was established by the Air League of the British Empire with Sir Miles Thomas, former head of British Overseas Airways Corp., as its chairman. It had no official status.

Sir Miles and technical adviser received from the aircraft industry indicated that Britain could realize the "blue rhombus" North Atlantic route within the next 12 years with a super-jet cargo capable of flying from London to New York in 21 hours. The 114 passenger aircraft would cruise at 50,000 ft. It would land and take off vertically.

44 Engines

A display model of the proposed airplane carried 56 engines in the main fuselage for vertical power and 12 engines mounted as vertical tail fins, six on each side, for cruising.

Fuel tanks were mounted aft and passenger seating in a tube in the center of the fuselage of the delta-shaped model. Sir Miles said the proposal had been evaluated technically by Rolls-Royce as a feasible project.

The committee's report said there is a growing need for a very large cargo transport operating at maximum speeds on the order of 500 mph and at altitudes of not less than 24,000 ft and over ranges of 5,000 miles.

It could use, he described on conventional engineering basis to operate at 70-80% of current cargo rates, the report said, while a bolder venture would be long-term development of a nuclear-powered cargo vessel which could reach several hundred tons.

"If cargo capacity might well be enormous compared with that of the more conventional aircraft, and its structural construction might well place the constraints in the lead in the remarkable transport of the future," the group suggested.

Realizing that world air traffic will quadruple during the next ten years, the committee said a proportion of the expected increase in traffic should be allocated to Britain's independent airlines.

It said BOAC and British European Airways, the state-owned airlines, had done a good job in a difficult period but should not "be saddled with extra responsibilities for the tremendous increase in traffic expected over the next ten years." The committee's report suggested that if they were, they might

become so large as to lose their efficiency.

Another reason was given by Sir Miles Thomas when he told a press conference, "I don't agree with this monopolistic attitude that has been a feature of the postwar British airline scene. Sir Miles resigned from BOAC last year.

Cites 707

The committee also suggested that Britain set up a growing unit—"some-what on the lines of the USAF's proving

unit"—to test new transport aircraft. It argued that military backing is impossible for the success of American transport.

An example is the Boeing 707 jet airliner, which is expected to come into operation on the world's air routes in 1960 or 1961," the committee said. "This aircraft has been cooked from the USAF's KC-119 jet tanker which had achieved more than 10,000 hours of development flying before the civil prototype took the air."

There was no mention of the fact



ARTIST'S conception of speculative jet transport based on advice received from British aircraft industry. Also is to make Britain leader in world air transport.

CONVAIR B-58/major portions of its primary structure are made of HEXCEL HONEYCOMBS



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that Boeing built the 737 prototype, with its own money before receiving an order for it.

More before, however, was disappointed at what this signaled in the highway and aerospace nature of its report. But the executive said, "We feel most strongly that this country must be responsive and reach out into the future in accordance with a vigorous, efficient capability of vertical talent and leading and of raising the Atlantic in between two and three hours. We are attached from expert evidence given to us that this is a practical proposition within the next twelve years and it is far in economic reality as well as a matter of prestige."

The executive and Britain with such an aircraft would open the blue skies of the North Atlantic, increase exponentially its aircraft export market and under the new defense policy be in a position to control its military forces anywhere.

Conceding that the project would be beyond the technical and financial resources of any one firm, the report proposed the belief that if the leading firms combined in a syndicate form under expert leadership, city leaders might come to their aid financially in the manufacture of the aircraft.

French Use Flybys To Promote 1649As

Paris-Air France is introducing its new Lockheed 1649A Super Straker Constellation to the French public with an advertising stunt located at millions of vacationing Frenchmen.

Under the Air France plan, a Super Straker is shown carrying 1,700 ml from one end of the French coastline to the other. The flight is made in an altitude of 1,000 ft. Several days are involved in the company's advertisement in hundreds of newspapers, giving the date of the flight the complete list of the hundreds of beaches the aircraft will pass over along with the exact time it will fly by.

The ads promise vacationers that "you can get your wish by a Super Straker." Configuration changes are not given for any getting and readers are told that "the black zone you see holds the weather radar."

The flight began at Abbeville on the French coast at 9:55 hours and ends with a landing at Nice at 19:05. So far, the company claims, it has hit the right scheduling on the air.

The advertising program actually was first used by Air France in 1953, when the company was advertising its Super C-1. It was such a success with the public that Air France officials decided to do the same thing with its 1649A.

AIRLINE OBSERVER

• Civil Aeronautics Administration expects to commission ILS facility at Washington National Airport with ground stations located in the runway to the southeast, 1958. Flight services will eliminate the 1961 action in instrument approaches and ground linkage under conditions approximating economic. RFA-type narrow gauge (AW April 13, p. 59) that through the "black jet" division in landing also will be installed. Meanwhile, no less and Port of New York Authority have tentatively agreed on final type continuing runway lighting for the planned parallel instrument runway at New York International Airport following a recent meeting in Washington in which the CAA reported on tests of the lights at Andrews Air Force Base.

• Rolls-Royce has ordered a Victor Vauxcel for use as a flying testbed. Aircraft is being completed.

• The American World Airways last week applied to the Civil Aeronautics Board for permanent authorization to operate service between Seattle, Portland, Hawaii. The airline currently holds a temporary certificate to operate between the Pacific Northwest and Hawaii and a permanent certificate to operate between Los Angeles and San Francisco and Hawaii. Northwest Airlines, which operates between Seattle, Portland and Hawaii also under temporary authorization, has not yet filed application for a permanent certificate on the route.

• Transocean Air Lines has been awarded a \$2.5 million domestic cargo contract by the Navy to operate scheduled flights five days a week during fiscal 1958 over a 7,500 mile route linking naval centers between the western point of Alaska, Cold, and Boston. The supplemental cargo contract is for longer than two million miles of flying and more than 20 million ton-miles during the year under the contract.

• Rolls-Royce engines are specified by both the British and French Air Force in their short medium range jet transport designs for British European Airways (AW Aug. 5, p. 47). British 250 also is ordered with Olympus 553 engines although RFA favors Rolls-Royce powerplants due to the favorable experience with Dart powered Vauxcel. Rolls-Royce engines involved are the RB-141 Conway at 12,000 lb thrust and RB-140 with 5,000 lb thrust. British and de Havilland are each proposing three and four engine models for the RFA's consideration. Decision, originally due July 18 (AW May 17, p. 41), should be announced soon.

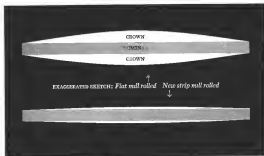
• Northwest Airlines President Donald Nyberg has re-emphasized the airline's intention to produce turbine-powered aircraft. "In order to survive, our company will be fully competitive in the jet age," Nyberg said. The company is producing "turbine engine" in its evaluation of aircraft that will be available and adds that "a great deal of time and attention is being devoted to negotiating final arrangements..." Northwest Airlines is the only U.S. trunk carrier that has not placed an order for new turbo-prop or turbo-jet aircraft.

• Air traffic control radar beacon system will soon undergo a source evaluation tests. Approximately 250 air carrier transport aircraft and an indefinite number of civil aircraft are being equipped with transponders in part of the evaluation program.

• Flying Taps Line is attending sharp income in gross revenues in its new fleet of 12 Lockheed 1649H Constellation placed into service in May. Revenues earned in May and June amounted to more than \$6 million, or approximately \$2 million over the carrier's average last year. The airline also reported that the Constellation enabled it to report the first monthly operating profit since last September. Operating profit for May and June this year totaled \$330,000.

• Rolls-Royce Dart turbo-prop engine operated in North America have passed the million hour mark. Trans-Canada and Capital Airlines Vauxcel aircraft for the longest utilization of the engine.

Weight slashed on wide sheet



Modern 4-high strip mill equipment for wide sheets provides backing strength to the working rolls. Wide sheet was previously made on old-fashioned flat mills (2 rolls high) and the rolls deflected in the center, resulting in excessive crown and weight.

New Alois rolling equipment recently installed across a lot in the existing industry. The new facilities virtually eliminate "crown or concave" in wide sheet. Weight and cost per sheet are greatly reduced. The same thickness precision previously available in widths up to 60 inches is now obtainable in wide sheet.

For example, a sheet of .090-inch nominal, 84 inches wide and 24 feet long, when rolled on a flat mill, has a typical crown of .008 which adds 13 pounds excess weight. When rolled on the new 4-high strip mill, typical crown is reduced to .0018, leaving only 2.44 pounds excess weight. Weight saved per sheet, 10.56 pounds or a reduction of 6.6 per cent. Dollar savings are proportionately substantial.

With these new facilities, Alois can effectively minimize crown in sheet 40 to 84 inches wide in thicknesses up to .125 inch nominal. For more information and specifics on the weight and cost saving on your requirements, see your Alois sales engineer or write ALUMINUM COMPANY OF AMERICA, 1000-B Alois Building, Pittsburgh 19, Pa.



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See Guide to the Best in Aluminum Sales

SHORTLINES

► **Trans World Airlines** will begin overnight service between California and Europe on Sept. 29 using the Lockheed 1049 Constellation on the much awarded polar route. The 1049 will be used on the San Francisco-Puerto Rico flight as well as the Los Angeles-London schedule. The 1049 also will be flown on a new routing New York-Rome route beginning Oct. 2.

► **Flag Air Line** will begin through-plane, all-cargo service between New England and major Midwest and West Coast cities in October using newly-delivered Lockheed Super H Constellation. The service will run from Boston and Hartford, Conn., to Chicago, Los Angeles, San Francisco and the Pacific Northwest.

► **Southern Airways** will inaugurate regular daily service to Fort Air Force Base, Fla., on Sept. 3. Two roundtrip flights a day to Atlanta, one via Charlotte, Ala., and the other via Columbia, Ga., will offer both military personnel and civilians their fast direct air service to the Georgia capital.

► **National Airlines** reports a net income of \$3,113,494 for the 12 month period ending on June 30. Total operating revenue was \$56,821,671, total operating expenses, \$58,115,430.

► **Bonanza Air Lines** flew 2,818,660 passenger-miles in July for an all-time company record. The airline carried 12,375 passengers during the month, a 1.8% increase over the previous month. Bonanza reports to start new nonstop and connecting routes in Salt Lake City from Phoenix soon if the move is approved by CAB.

► **Lufthansa, German Airlines** will offer a 10-day tour to Europe from Chicago beginning Sept. 15. Features of the tour include a balloon chase in Rome, visit to a Geneva cosmetic factory, tour of a Paris perfume plant and visit to a London cooking school. Price is \$345.75.

► **Vickers** latest version of the Viscount 800 now has made its first flight equipped with new Rolls-Royce Dart II D7, Mark 527 turboprop engines. In its first tests, this version will be known as the 510-740, the 510 being fitted with the R.D.7 engines and the 740 with the R.D.11 turboprop engines.

► **North Central Airlines** extend a new one-day company record of 2,638 passenger-miles on Aug. 16. Low fare carried over 100,000 passengers this year.

COCKPIT VIEWPOINT

By Capt. R. C. Robison



Zero-Zero Landings—IV

The experimental flying at Andrews Air Force Base described in previous columns yielded enough data to fill several volumes. I personally find that these flights were of tremendous value and that we need more. Here's why.

As in previous years 1957 has seen a continued struggle by many airlines to stay in the black—there are even applications for a tax on loss for this purpose. Indeed, industry is the great enemy of all business of aviation. And even in a highly competitive and efficiently run point-to-point, revenue-based transportation business there is a strong tendency to sell. On the airlines this means schedule reliability. Reliability means on time departures and arrivals—means it's dependable, not alternate.

Second Fiddle?

Obviously one gets the impression that some airlines have allowed operational matters to be relegated to a second fiddle position behind a sales push. Selling is obviously important and I would not attempt to belittle it. But first you must have a product to sell.

At best airline profits represent a small fraction of total investment. Debris, obsolescence and competition can easily wipe out the "gross". Wouldn't bookkeeping be infinitely more interesting if something went on behind the scenes? As with any other part of modern business the operational and revenue records and thought and work—and money too. It means looking out and upward as well as inward and on the ground.

Since this is experience. And who needs to be looking which way we are recommending an expenditure—in the millions. Yet airlines costs are as high as the basket compared to the money that will be invested in our airports and the profit there would make if they could operate on schedule all the time.

Some there is test flying going on all over the place on all manner of projects. But there are two drawbacks to that. For one thing it is difficult to see but pass by themselves and thus properly evaluate their relationship to an airline system. Second, as regards safety, the testing may not be done with an eye to airline operational problems.

It would appear that we could very well use an airline flight test group to evaluate various devices for commercial use. This might mean instruments, radios, lighting to what have you. Furthermore there is an aspect and use to report to which all the various devices and techniques could be tested under actual conditions. For every case completed pilots have contributed their own fly-while-it-works condition. But as yet we have no airport properly implemented to prove or disprove this possibility.

Second Drawback

It has always been the practice to install a new system at a regular interval and, after a certain amount of testing, sell for customers. Some pilots wish. This has one unusual drawback—many pilots may not be segmented with alternate possibilities and therefore have nothing with which to make a fair comparison. Such a method was used a few years ago to prove that a completely new type of approach lighting was desired. Never having seen the other configuration many pilots blind the test night lights this run. A lighted bar sign at some of the darkest airports would have rendered the same welcome.

An experimental aspect of it, of course, one of the recommendations of the Curtis Report—oil of aviation would gain from such an installation. The Andrews project is now over once equipment—and the money—had to be obtained. There is much work yet to be done with more lighting. By taking the lead and pushing for more of the operational test flying I am sure the airlines would benefit greatly in the long run.



General Electric Missile Alternators Feature Light Weight, Low Harmonic Distortion, Close Voltage Regulation

High accuracy and reliability under extremes of environment has been attained by General Electric alternators for missiles and advanced aircraft. A wide variety of package systems including alternator, regulator and exciter have been designed in ratings from 4 to 10 KVA, operating at speeds of 12,000, 24,000 and higher rpm and at 400 cycle frequency and above.

Typical of these advanced systems is the 2600 rpm alternator shown on test above. Rated 18 KVA with an overload capacity to 23 KVA, this 22,000 rpm machine is mounted in the drive section through an internal upspeed shaft. A wide variety of prime movers including the missile hydraulic and air turbine drives can be used.

The 115/200 V, 400 cycle, 1 phase alternator has wound field excitation allowing close output voltage regulation under widely varying load conditions. The rotor is capable of withstanding 30% over speed at temperatures up to 500 F. Total RMS harmonic content of the alternator output is less than 3% of fundamental.

The machine's power factor rating is .80 and it has an efficiency of 85% at rated load. Forced air cooling of approximately 300 pounds per minute, cooling to a 50-60 deg F pressure drop at sea level, enables the machine to deliver rated output continuously from 0 to 30,000 feet.

Completely self-contained, the machine requires no external excitation power. The alternator and exciter are combined on a single shaft and enclosed in one compact package.

The 800-cycle exciter supplies power to the voltage regulator which is then fed to the main alternator field in varying amounts to maintain constant voltage output. The negative amplifier-type, voltage

regulator is completely static and is also self-contained. It provides less than 2% voltage regulation over 0 to 18 KVA load, 11,500 to 13,000 rpm speed range and in temperatures ranging 0-50 to 300 F.

For more information or assistance in solving your missile or aircraft electric power supply problems, contact your local General Electric Aviation and Defense Industries Sales Representative.



General Electric regulator (left) and alternator (right) combine in a 26 pound power package rated at 18 KVA, the alternator 18 1/2 inches in length and 8 inches in diameter. The voltage regulator is 8 inches long. Total RMS harmonic content of the alternator output is less than 3% of fundamental. The generator has an efficiency of 85% at rated load.

New, Self-Contained Missile Accessory Power System Gives Both Hydraulic and Electric Power

A completely self-contained, General Electric auxiliary power unit is now available to provide simultaneous hydraulic and electric power for missile systems. A new unit model based on this advanced design uses two alternators and a hydraulic pump to furnish 2000 watts of 400 cycle, 115-volt 3 phase ac power, 100 watts of 2000-cycle, 115-volt, single-phase ac power and hydraulic pressure at 2200 psi and 475 gpm. Frequency control of both electric power systems is within $\pm 1\%$ and voltage control within $\pm .5\%$.

A complete unit weighs 35 pounds or less and all components, including turbo drive and fuel tank, are contained within two cylinders, each 24 inches in diameter and 15 inches in length. These cylinders can be mounted side by side or in line.

A noncompressible fuel tank in cylinder ends opens the turbine wheel and provides the drive power for the alternator and pump. A venting system carries the fuel and also provides a starting air

injection burst to bring the unit to rated speed and output within a half second. The fuel tank contains an integral pressure warning sensing hot gas from the decompression chamber to activate a stop point. This allows for the need for precompression, purges or plumbing external to the unit.

Rate frequency control is obtained with a load neutral loop consisting of a frequency divider, a locking character and parallel locking reference. Constant speed is maintained by placing a bypass bypass on the turbine shaft to balance changes in load demands.

The advantages of this advanced missile APG can be easily applied to any person or problem. The modular design allows modification for a wide variety of applications by attaching matched hydraulic and electric components rated as required to a choice of turbodrives. Fuel tank can be varied to provide operating output from 25 to 347 seconds depending on the turbine and output components used. For



New, General Electric modular APG combines an advanced design combining several electric and hydraulic power sources into one compact, completely self-contained unit. This particular version, with one turbine power source, weighs only 35 pounds, including fuel.

more information on this advanced missile power system, contact your local General Electric Aviation and Defense Industries Sales Representative.



Whether 10 or 10,000 hours, General Electric pulse-forming network systems are engineered for the life span of your specific application. Thirteen-year accumulation of test data helps General Electric engineers meet your specific conditions.

How 13 Years' Application Experience Can Help Solve Your Pulse-Forming Network Problems

Since 1944, General Electric has been designing, building and testing capacitor pulse-forming networks of practically every type. A wide variety of data and experience has been accumulated on temperature, voltage, distortion and the other factors that affect service life and reliability.

Today, the wealth of accumulated data and experience can help solve your particular problem. General Electric pulse-forming networks can be designed and produced to meet service life requirements of 30 or 10,000 hours or more. Pulse width, rise time, number of pulses per second, ripple, and most other requirements can be met with solutions based on accumulated data and experience. Data on multiple width networks and rise rate networks can be found on consultation in the available

Quality manufacture gives General Electric pulse-forming networks the dependability required for multiple applications. Capacitor sections are constructed of heavy lead paper and high purity aluminum foil. Inductance coils are wound on shielded forms for stability throughout the life of the unit. Highest quality material is used for impregnation. Strong, hermetic seals would make help protect our components.

For more information on pulse-forming networks, consult your local General Electric Aviation and Defense Industries Sales Representative or write for Bulletin GEI-4998, General Electric Company, Section 218-280, Schenectady 5, New York.

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SKYHAWK flight photo demonstrates small size of the "midget" attack bomber

A4D Design Opposes Complexity Trend

By Irving Stone

El Segundo—Simplification and low cost concept underlie the Douglas carrier-based A4D "midget" attack bomber. It is the philosophy behind many reasons now being propounded for the aviation industry.

Although established five years ago, the design approach for the A4D Skyhawk, smallest and lightest of U.S. jet carrier-borne planes, brings these advantages:

- Most aircraft for given investment
- Shorter production time
- Increased performance
- Easier handling on carriers
- Ease of maintenance
- Fewer spare parts

Original requirements for a high-performance carrier-based attack plane specified atomic bomb delivery, non-

nuclear attack capability similar to one provided by jet-powered AD types in Korea, maximum radius of 100 nautical miles, 100 lb V_{max} and 90,000 lb maximum permissible weight.

Design Schedule

Led by Edward H. Hunsacker, chief engineer, Douglas El Segundo designers took a fresh approach to overcome the trend toward increased weight and complexity which boosts costs, development and production time. After an analysis of requirements with Navy Bureau of Aeronautics, A4D design evolved with V_{max} of 390 kt, combat radius was stretched to 100 nautical miles, gross weight was pared to under 15,000 lb.

First A4D flew 20 months after BuAer accepted the proposal in Octo-

ber, 1952. First delivery of the A4D to the fleet was on Oct. 25, 1956, only 4½ months after start of engineering design, considered a new record for normal high-performance jet aircraft.

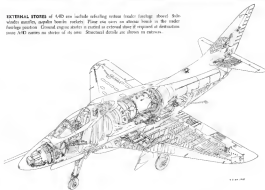
Requirements were substantially met. Empty fuselage at 107 lb. Basic takeoff gross weight with gasoline for fuel was 14,000 lb. Now, with switch to JP-4 and additional equipment, basic takeoff gross is 15,700 lb.

Avoided on stretched design was girthy tail cone, large weight factor, but also mass manufacturing problems. Compared to the earlier AD types, A4D only has about one-third as many structural detail parts.

Structure is broken down into four major assemblies—forward fuselage, aft fuselage, wing and stabilizer. The division would permit manufacturing of



EXTERNAL STORES of A4D are selected within fuselage (above). Side stores mounted, supplies handle vertically. Flare can store on atomic bomb in the under fuselage position. General engine starter is located in external store if required at destination. Many A4D carries no stores at all time. Structural details are shown in cutaway.



COMPLETELY WING is mated to A4D fuselage sections in final assembly.



FUSELAGE INTERIOR, looking forward, shows deep bulkhead mounting engine on intake openings.





This symbol

With the exception of the 1994-1995 season, when reports of the prevalence of the parasite were low, the prevalence of *Cl. parvum* was 100% in all samples collected.

These facilities



Sculpture in motion



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TABFOLE rubber has single sheet for each side

the separation of feedage feed trials, and
certain circumstances.

Section Conventions

lightweight slim (0.5) between rock pit rule. Bone tissue compartment forward buckled back to fracture breakpoint, has longitudinal crinkled bulk edge stiffness which can avoid loads to knee tension bolts or behind fitting connecting facade forward suction to air suction.

Skin from cockpit rolls down to knee
members is 964 in national railroad
is vertical called Zachary Verducci
was used in the area because of better
than elsewhere than obtained with
unmodified stiffness

Interna organic components for wood bulkhead and barge berthings are two major factors for connection to wing brunt and intermediate spurs. Pairs connecting to the intermediate spur is located at barge bulkhead and is a single pair, being subjected from a loading reaction to one perpendicular of the structural axis.

Life Processes

Fuselage aft section, housing engine tailcone and tailpipe, resembles different construction similar to that in forward fuselage between engine compartment forward bulkhead and cockpit: Midspan generally consists of light channels about 23 in. deep, about 15 in. apart, with two Z-section vertical stiffeners, spaced between

There are three major bones in forelimb (left section—out for connection to wing and spine, another for carrying armwing back, vertical and side loads) and a third bone (flapping) which connects to the spine and also carries part connection for horizontal stability.

Fins and dorsal are built integral with bodycase. Fins are a simple single-piece mold with spar made of bar stock inserted into a channel. Folds are single-piece light-gage sheet metal attached directly to the bodycase sides.

Rodder is a trailing edge splitter plate type known as a 'tailgate' because of its chordwise shape. Leading edge also terminates at about 50% of total rodder chord. From this point aft rodder is composed of a series of 1048 short stiffeners on each side to chordwise

tapered bit-threads spread on 8-in centers. This arrangement is incorporated in the ADO-7 to prevent rubber failure.

Height of aft fuselage section above ground eliminates need for tail bumper, saving considerable weight and complexity.

Wing Plane

Wing is a two-field configuration because it has only a 27.1-H span. This case might not comply with push and fold mechanism, parameter sets, and resources requirements.

Wing platform is a modified delta Stratosair construction a foot over his

with upper skin and stronger all over, because almost top-to-top. Flare the top of the wing box, coupled with stronger configuration, affords a constant stress level which characterizes square root for using a tapered skin.

Slit is 164 in thick, 27 ft long, 4 ft wide, and is the largest thin-page sheet ever rolled.

Overall continuity features in compact because entire box structure almost top to top, is an integral feed tank. The design affords simplicity, light weight and tank sealing integrity by virtue of the continuous nature of tank walls.

All respondent and abstract structures

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New Bulletin #18008 tells about

other up-to-the-minute Oakite materials and methods for specific evaporation cleaning problems. Write Oakite Products, Inc., 35 Rector Street, New York 6, N. Y.



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Technical Service Requirements in Revised Class of 2000 and Class of 2001

Next logical step after Vanguard?

THE FAR SIDE OF THE MOON

We don't know what we'll find there—it's the side of the moon we have seen.

Yet, after Project Vanguard, a flight to the moon—and a look at its far side—would be the next logical step in our penetration of outer space.

To make this step, we must solve the problem of guidance: How do you direct a rocket out and around the moon and then back to earth?

The most promising method to date would divide the use of inertial guidance systems such as Honeywell has helped plan and develop.

Honeywell's inertial guidance systems consist of ultra-precise gyro, accelerometers, computers and associated electronics that enable a missile to know where it is and how to reach its destination by "memory banking" where it started from and where it wants to go. It provides guidance far beyond the reach of radio or radar.

Pioneering in the research, design and production of airborne controls has given Honeywell the advanced technical competence you can rely upon in the solution of your air-borne control problems. Contact Minneapolis-Honeywell Aerospace Group, 2600 Highway Road, Minneapolis 13, Minnesota for valuable assistance—free of charge—in final production.



Actual photo of the Honeywell space reference system designed for Project Vanguard. This Honeywell inertial-type guidance system will guide stages one and two of the Mercury-designed earth-orbiting launching vehicles. Third stages will then cut loose to position satellites in their orbits.

Honeywell

 *Aerospace Division*



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Operating Range	Temperature Range (°F.)	Max. Pressure (PSI) Size 0-70° F.
Low	-300 to +750	13000 psi
Medium	-300 to +1300	23000 psi
High	-300 to +1400	Testing still in progress

A 21/2" Conoseal joint has been tested with air and exhaust up to 43000 psi.

Problems of connecting tubing and ducting of distributor models subject to extreme temperatures can be solved with the new Marmar Conoseal Tubing Joint. An all-metal joint, it provides metal gasket compression with the flexibility and sealing qualities formerly obtained only through use of gasket units. The Conoseal Joint withstands axial deflection up to 1/16-inch without sacrificing a perfect seal. The seal is maintained under extreme pressure and temperature even on joints with material transitions, in which steel and aluminum alloy plating are joined.

The Conoseal Tubing Joint is available in three different operating performance ranges to meet varied applications. Standard sizes from 1" to 12" O.D. tube size, with special sizes designed to your requirements. Write today for full engineering details.

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is attached to wing box without sheeting tank web. Thus, fittings are attached to the box structure and sealed on the inside along with the tank. Near rib fittings, for example, are where belts sealed to the tank made and providing structural access for wire ribs to outside.

This permits easy rib replacement, correct tank integrity.

Integral Fittings

All spars, actually channel-section sheet webs, are machined from 700-thick plate. This is to reduce oil leak paths and parts to a minimum. Wing-to-fuselage and landing gear spar webs are machined integrally with spars. Front spar is machined straight, then bent in board due to aerobics to wing sweep.

Main sparwebs are Z-section extrusion cranked to the slot in, NACA-type even for efficient sealing. Sparwebs are attached to wing bulkheads by aluminum alloy bolts and nuts in an eight bulkheads consisting of sheet metal web with extruded T-section caps and cranked both angle stiffeners are attached to the ribs with their ribs only being exposed in aft portion of wing. Bulkheads generally are attached only to extruding flange of the Z-section stiffener. This provides, while retaining their locking control, clearance built-in to different attach clips and simplified maintenance.

Access Openings

Access to wing box for assembly and test maintenance is through openings uniformly located openings about 5 by 10 in. in upper wing surface, chosen because of better fatigue resistance, since upper skin is in compression after take-off. Also, upper skin openings are less susceptible to fatigue than bottom openings.

Number of small openings rather than fewer large openings affords improved tank load-carrying capabilities, easier and quicker tank maintenance. Another benefit is that oil never drains on some skin, hence, interchangeable and are disposable servicing with integral O-rings.

Loading edge wing that requires no detaching maintenance, is opened via-

dynastically in accordance with flight conditions.

Landing gear root section, external to wing box, section 20 was chosen, also known main landing gear wheel as retracted position and external retractable engine's built. In wing root section an internal side an emergency drop-out wind-up retractor is fitted.

Landing gear section located, characteristic for emergency extension device, inner gear well finished and lock in position from front of section (Note gear also section forward and the full for emergency extension).

Wing is a complete structure combining all maintenance structure to fuselage major flanges with low steel tension bolts of landing gear root section internal, front spar, intermediate spar, rear spar, and taking edge rib section.

Portion of continuous wing box fast track, benefits turbine section of the engine is divided with 600-psi stainless steel bonded to wing top skin.

External Stores

Three plans on wing undercarriage are fuselage center and 1/4 in. each side of center-line structural provisions to carry many types of external stores, including static loads (as wingborne missiles (Solexwing), rocket launchers, etc.) and in-flight refueling slots when aircraft serves as a fuel tanker. Since the aircraft serves as engine starter, relying on Douglas-designed ground starts, provisions is made to carry first ground start as an external store if it will be required at distribution.

Modified delta laminated stiffener is provided at front spar, attached at rear spar. Upper skin is 125 in. by 1/4 in. 100. Lower skin is 100 in. by 1/4 in. internal sheet 1/12 in. thick, sealed into a raffle pattern which serves as structural bulkhead cap material and breaking material. This arrangement was dictated by demands of vibration control and to minimize weight and assembly.

All control surfaces, except ailerons, are control closed.

Maintenance Requirements

A4D has lower maintenance man hour requirement than any other jet fighter in jet service, Douglas maintenance engineers are, requiring 30.7 maintenance man-hour per flight hour according to first experience. This is claimed to be 35% less than any other aircraft of similar performance in the attack category.

Bank of test and support component installing tools, are standard off-the-shelf items.

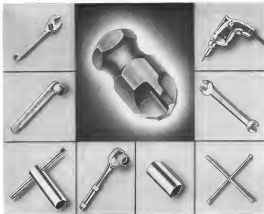
Crackup maintenance is installed to permit easy rear access for replacement of individual units.

Now wheel well contains primary



Cost aluminum inside line will be the ultimate in accuracy and finish. If you require tolerances, physicals at searchless beyond the ordinary you should be interested in the unusual fancy methods of Aeroquip and its subsidiaries. Yellow Springs 4, Ohio

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One simplified Tool Design for **TORQ-SET**, lets you use any driving means

Torq-Set offers you unique advantages in modern aircraft fastening by providing:

- 1. Tool Simplicity:** any standard power or hand tool can be used with this simple one-piece bit for installation or removal.
- 2. Tool Strength:** the bit well-balanced to resist strength.
- 3. Tool Accuracy:** extreme accuracy and added strength through forging or milling to finished dimensions.

From a **tooling standpoint**, assembly is simplified because the Torq-Set bit is a one-piece unit that can be used with any driving tool. Only 3 socket sizes are needed to fit the entire range of Torq-Set bits.

From a **service standpoint**, you can use a wide range of tools with the bit to install or remove Torq-Set (see illustration). What's more, the bit design lets you get in close to the work area... no need to have wide-open work areas to apply a tool. No adapters are needed.

From a **design standpoint**, bit and nut are as balanced in strength you get full benefit of maximum torque (well above actual requirements) without burring or distortion of either member.

Find out more about how Torq-Set can help solve your production problems. Write for a new booklet — "Torq-Set... a new concept of aircraft fastening."



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power panel on one side, air-conditioning equipment on other side. The equipment is accessible through open areas, even those in no ejection plates or doors. In flight, with gear retracted, nose gear door seals against the component to protect the equipment.

Gauge attaching system consists of a simple open-end-closure inspection. Concept is held in open position with bar gear tool.

Self-retaining fuel cell located aft of cockpit is accessible through fuselage cross inspection plate. Removal of door plate and lock cover plate, together with inspection and closing up, can be done in about one hour.

Fuselage bracket for J85 engine removal can be opened in about half hour in time as they are by installing four main bolts. Without breaking the fuselage joint, about 75% of the engine accessories and other control equipment are accessible through inspection plates on each side of fuselage.

Storage Considerations

Made lightweight characteristic of the plane is extended to engine, with limited space around engine. Fuselage rear section can be moved aft, thus limited clearance between nose and wing leading edge. Engine can then be removed and stored outside aft of wing. This arrangement permits deck storage almost within the block dimensions of the engine.

High check air inlet ducts for jet engine have reduced lengths rather than 30 ft more than 50 ft, compared with other aircraft using same size for jet engine. Ducts create minor vibration decline.

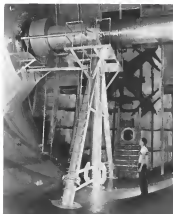
Replacement of wing as a complete unit is relatively fast, does not involve carrier wing, section-to-fuselage connection, inspection, as in conventional configurations, also means that there will be no wing panel misalignment or slight case when new wing panel is replaced as part of design.

Wingding is not adapted to automatic jacking, but supports of such are same diameter, measuring problems easily dealt with jacking parts and hand tools.

Attachment of upper and lower wing tips to fuselage structure and upper tips to load hold dunnies is done on Denavit center. This operation involves about 11,000 rivets (1/12 in. dia.).

Wing brackets also are about 50% of 1/12 in. mesh in attachment of cap angles and vertical stiffener members to web. This work is done on Chicago automatic rivets.

On wing and fuselage extension box, support brackets act as that in level (5 ft 9 in.) accommodation, average member's height is that he will not have to cut himself in reach



Fix Cuts Lewis Tunnel Vibration

Shall report for which NASA's Lewis Flight Propulsion Laboratory, Cleveland, Ohio, was to permit its 10 ft x 30 ft jet engine Mach 3.5 gas-turbine wind tunnel to shut out work on schedule over a year ago. The additional support provided by this device kept the tunnel's main compressor drive shaft vibration within acceptable limits (0.001 in. amplitude) thereby giving a year's operating time, valued at \$1.5 million. The hydraulic cable positioned shaft held two 16 in. diameter rollers against the large shaft to steady it as it turns up to 475 rpm speed and delivers 150,000 hp, to the main axial flow compressor. A small electric motor has been used to keep the large 705 lb long shaft system running slowly and continuously so that a permanent lag in any one position wouldn't develop. First Lewis Laboratory engineers received \$400 cost for their work on that shaft system which kept the 152 million hp, rate constant. During the first year's operation the 16 in. shaft system has provided otherwise unsatisfactory data on the performance of this 240-Mach 3.5 compressor. But because of its presence was the vibration of the J75 engine operating as a B-56 propeller pod at just over Mach 2.

work. This arrangement reached from shaft to lower worker fatigue, speed maintenance time. Platform also affects on upper working level, vibration level for confining.

One of only few major components—forward fuselage, aft fuselage, wing and stabilizer—permits installation of associated equipment in such of their main on the production line, allows operation without break before final assembly.

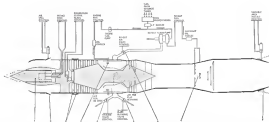
This clearance final installation has, necessarily, had a short operational time for overall system checks after

various major assemblies are joined.

From beginning of initial assembly to final time, elapsed reassembling period will be 16 weeks at maximum production rate schedule.

F-105 Goes to Eglin for Armament Testing

Republic F-105 Thunderbolt fighter bomber arrived at Eglin AFB, Fla., for armament and fire control tests expected to last several weeks. Test aircraft was flown from California



DE HAVILLAND layout for Mach 2.5-3.0 propulsion system. (1) variable inlet guide vane; (2) inlet air window spill door to help match the inlet flow to the compressor; (3) variable inlet guide vane and compressor stator; (4), (5), (6) air bleed for cooling; boundary layer control and parametrically resonant fuel pump; (7) variable area exit nozzle; (8) fuel flow to the main engine; (9) fuel flow to the after burner. Basic layout, which resembles Gyron, is only relatively small part of system.

Gyron Fits Mach 3 Propulsion System

By Robert Cushman

Compared with complex high non-pertinent inlet engine and variable inlet engine systems, the conventional Mach 0.5-2 flight de Havilland Gyron stages of first phase to be a backward step.

However, the complete picture of the propulsion system into which de Havilland considers blending the latest Gyron turbines have turbines will tend to become second-phase to supersede in its and completely different in its concept, typically Mach 3 speeds.

In this layout, an engine tender to the Gyron though with one less component stage (see outline) is used

which between a compressor inlet and ahead of a large turbofan section leading to a variable exhaust nozzle the fuel portion of which can go fully through.

The basic Gyron (AW Aug. 19 p. 10) is a straight-forward engine. Other than the greater tip-to-base area of the compressor and the fully variable combustion chamber, the Gyron looks like a larger version of some of the powerplants in the J47 jet.

Earlier fuel geometry, single speed turbines and a thin diverging nozzle design had not developed the more complicated higher performance engine. But the Gyron has increasingly been designed for speeds three times as

great as the maximum attained by most of the other engines with superficially similar appearance.

The Gyron's task, comes as inherently wide speed and altitude range. It must get an aircraft off the ground and to efficient speeds and altitudes both in providing thrust itself and in pumping air back so that the afterburner can operate. Then at Mach 2.5 speeds and 30,000-50,000 ft altitudes the Gyron must count the force of high, high-pressure flight. To meet this change the compressor rate has previously been made low, and therefore the engine simple, since at Mach 2.5 speeds the most important part of the compressor has already been performed by



INLET AND OUTER: these tubes (left) show Gyron's fully variable combustion section turbine inlet air ducts, also being steps, large diffusers in parts. Other components are variable inlet guide vane and typical compressor inlet blade and guide vanes (center), and light and second stage turbine nozzle (right).



The structures engineer who found a fast detour

"Advise and assist on structural problems, Do what you can to keep the program moving..." With this outline of his latest duties, Stress Analyzer Ed Clay accompanied Vought's Regulus II missile to its desert test site.

On the down, Ed found a dearth of structural problems. Regulus II reliability gave the flight test program tremendous momentum. In quick succession the missile notched 10 flights. When time came for a critical high-speed test, the program was three months ahead of schedule.

Then, the very fact that things had moved so fast threatened to rob the program of the facts it had gained.

At Vought had planned, a wind tunnel flutter test had to precede the upcoming high-speed flight. But Vought's prearranged date at a government test was now a month away. The facility was booked solidly up to the appointed day. And Vought's own Mach 5 tunnel was under construction.

Then Ed revealed the scope of his mission. It had ranged to the rocket test track at nearby Edwards Air Force Base. There, with the help of a cooperative tank project engineer, Ed had spotted a missing rocket sled, left behind from a previous test. Now, if the sled could be rigged to carry the spare Regu-

lus fin, Ed figured, they might get flutter data before the tunnel test.

That changed Ed's state of leisure. All Vought was suddenly at his service. Shopmen rewired the sled to accept the fin. Inspection technicians found the fin with pages and thousands. Vought's top flutter men double-checked, raised their eyebrows, then endorsed the whole thing.

At the track, moments before the rocket exploded, Ed had a twinge of doubt. His sled was a mess—indeed, Air loads would be terrific.

Then the sled shot off on the first of two successful tests that revealed all the facts required.

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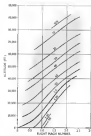
The newest member of this famous family is the Model 1013 designed for photo and television reconnaissance application. With multiple camera installation, the remote controlled Model 1013 can be used for both day and night observations.

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POSSIBLE flight envelope for a Gyron jet and its parent, the D-101, shown in the de Havilland graph. Plot shows how fast control drops off sharply at high altitudes.

the aircraft inlet. Unfortunately, along with the pressure boost from the inlet goes a corresponding temperature boost (over 1800°) which will be added to the compressor's own temperature rise so that the later compressor stages will have temperatures as high as those on the turbines of some early engines.

Test Problems

Although de Havilland said that its engine has passed static type tests it did not make it clear whether the Gyron had been fully started and run at turbine high Mach conditions. It seems unlikely that it has without help from facilities on this side of the Atlantic. For tests a short on ground test facility to simulate high Mach conditions on an engine of this size and size of the living test bed was needed in conjunction with the Gyron test bed.

The single rotor of the Gyron consists of a short compressor inlet compressor and a two stage turbine powered by a large diameter transport shaped front axial disk. It has previously been made stiff enough so that it can be carried on only two bearings with the turbine rotating.

Compressor blowing of the engine rated at 20,000 lb thrust at about 10,000 ft, is allowed to withstand the high ram temperatures developed at its maximum flight. It is then retracted for light weight. De Havilland said that the turbine pressure will equal at the exit of the compressor to keep the last compressor stage of ramjet type flow from backing up to the engine's heat

up, has proved to be quite successful. The combustion system is fully automatic and uses optimum fuel injection to keep the combustor and then the turbine hot and light.

The two turbine stages have blades of fully hardened Nimonic alloy using direct attachment. A major headache in the development program was the difficulty of obtaining an evenly distributed compressor flow profile on the turbine blades. Apparently the main difference between the D-101 and the D-102, 2 model is that the latter has made use of the combustion system difference in power output of the turbine inlet turbine distribution to the extent that the thrust output could be raised from 15,000 lb to 20,000 lb.

Performance Estimate

From the general type of the engine and from comments made already, it is roughly estimated that the D-101 is a 2,000-275 lb per sec air flow engine with a compressor ratio of 5 and a turbine inlet temperature of 1,500° while the D-102 has an air flow rate of 300 lb per sec, a compressor ratio of 6 and a turbine inlet temperature of 1,600°.

Another development problem was turbine failure of the turbine blade root profile from the de Havilland test. It was determined that these failures were being caused by both rotor vibration in the first stage and by third rotor vibration in the second stage. When the number of test operations was changed from 10 to 15 the stress flow was evenly distributed from blade to root and failures eliminated. De Havilland now demands Nimonic 90 first and second stage turbine blades in the lower throat D-101 but had to go to higher temperature Nimonic 100 blades in the first stage of the D-102. The Nimonic 100 blades are also hardened and have a much thicker wall than the D-101 to resist the higher temperatures. Higher temperatures of the D-102 thrust D-102.

De Havilland said that it used the scaled down Gyron engine to develop the compressor, combustion and turbine components and then scaled the results back up for the larger Gyron. The company also used the technique for air cooled turbine blades. Air cooling could bring the thrust potential of the large engine to 23,000 lb dry and 30,000 lb with afterburning.

To get around these delays, western because of lack of test facilities de Havilland is expanding its facilities at Bedford, England, to include a Mach 3-5 jet engine wind tunnel for developing engine inlet systems to go with the engine. It also is working on both conventional jet type engines and developing exhaust nozzles and

nozzle mechanical components, at least some in which air streams of air flow in the main flow are used to aid in burning the jet.

As for the control for a Mach 2-5 jet powerplant, de Havilland has found that it is a viable concept, propeller driven with no main rotating degree of freedom, control is just as important as the mechanical design. Accordingly the company is setting up an engine consisting of an inlet system, a compressor and an exhaust system. The inlet system will be combined with the engine in an attempt to develop a stable, high response control system to operate automatically at a single pilot throttle lever.

Comparing the best engine with a third response propeller engine, the best engine or a response engine appears less than half the length and half the thrust. De Havilland points out that the last few years must be so flexible that it will require, properly designed fuel in the lowest air rates which can be 30% even that needed for takeoff, when flying at Mach 10 it can be as low as 10% of its takeoff rate, when flying at 30,000 ft altitude.

Despite the Gyron's high performance capabilities, government interest was waning when the policy of shifting to missiles was decided.



OPERATION of the de Havilland engine under test, (top) an afterburner (middle) and (bottom) (bottom).

SEPR Rockets Power French Fighters

By David A. Anderson

Four-Proton rocket engines cleared for flight on Sud Aviation Trident II, Dassault's Mirage and a number of other French military and research aircraft now are being delivered by the Societe d'Etude de la Propulsion par Reaction (SEPR).

All of these engines are basically the same: built around combustion chambers developing 3,300 lb of thrust and using hypoglycolic (self-igniting) propellants. Current combustion is nine and its 99.5% concentration and fluidity.

Specific impulse of the engine is approximately 237 seconds.

Solid Propellants

Solid-propellant work at SEPR is increasing and now includes the production of boosters and rocket motor casings for a variety of aircraft and missiles, a two-stage solid-fuel rocket for an air-to-air missile, upgrades for rockets and solid-propellant starters for gas turbines.

Working up this impressive output is a test center at Marignane-Villeneuve near the town of Marignane, 100 miles from Paris, in the South of France, where facilities at Agropolis near Paris and the design headquarters and manufacturing at Villeneuve near Paris.

Test employment of SEPR is not under 1,000 full test technicians.

SEPR rockets have been powering

French aircraft for about five years. Four was a prototype for SEPR 6025 Epsilon used in development flight test of the engine before installation in the Sud Aviation Trident I (AOI Aug. 18, p. 10).

The Epsilon made its first flight on June 18, 1952, and was the first French rocket-powered aircraft.

The Epsilon engine has been developed in research through a number of chambers, but each has had the combustion chamber design in common. This reflects the company's philosophy, which is to design a good combustion chamber and develop the engine around that as a building block. Improvements in performance are expected to be gained by fuel changes rather than by burning chamber pressures for example.

Two of these engines are now scheduled for installation in the Dassault Mirage III and the Sud Aviation Trident II.

• SEPR 66, a single-chamber unit developing 3,300 lb thrust and installed in a pistonless gun under the tail of the delta-winged Mirage. This power plant supplements the main jet turbojet with afterburner. It has been flown in a Dassault Mystere IV through an extensive flight test program.

• SEPR 61A, a two-burner powerplant giving 6,000 lb thrust in two main stages, produced by firing one burner at a time. This engine functions more than half the design thrust of the usual powerplant arrangement. It is a direct

descendant of the SEPR 451 three-chambered unit used in the Trident I flight tests have been made with the 611 in the Trident II.

SEPR 66

The Mirage engine is strong not along a nose but axially which is intended to attach to the belly of the plane in a separate bay. Width of the packaged powerplant is about 24 inches and the length is put under one foot.

The engine is rated at 3,300 lb in sea level thrust, increasing to 4,600 lb at an altitude of 38,300 ft because of the reduced hindrance on the exhaust nozzle.

Weight of the unit is 300 lb including all accessories.

Specific fuel consumption is 0.0835 lb per lb of thrust at sea level, and 0.0045 lb per lb of thrust at 38,300 ft altitude.

This includes the fuel injection phase of the turbojet.

Control mechanisms are simple: a single power lever for starting or shutting down the engine, and the control and which does the job automatically.

Mechanically, the rocket powerplant consists of an electrical starter, three control pumps which supply the gas generator, a gas generator driving a turbine which drives the main fuel pumps, valves, jet pumps and the combustion chamber.

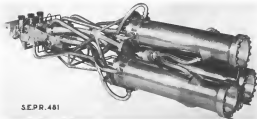
These components are packaged together with the necessary lines and controls on a structure and the whole needs supplied to the aircraft manufacturer. Total design requirements are specified by SEPR, but the tools are fabricated by the aircraft manufacturer. Small tanks are also required for water and methanol.

Firing Up

Starting sequence begins with the electrical starter driving the single-stage overhauling fuel pumps for the gas generator and three air drains of these pumps, one each for fuel, methanol and the water-methanol mix used to cool the gases and thus increase the life of the turbine. It takes about half a second for the pumps to build up pressure and then a pressure switch opens the lines to the generator.

Hot gases from the generator drive the single-stage impulse turbine which in turn drives gas drains, air, main fuel pumps plus the three smaller pumps for the gas generator. The starter is switched off when the turbine gets up to speed.

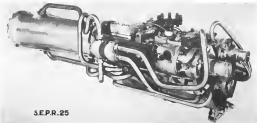
With the main fuel pumps at pressure, another pressure switch opens the main propellant valves and the chamber



COMBUSTION CHAMBER assembly of SEPR 451 shows some of the details of the three-chambered engine developed as a prototype for the Sud Aviation Trident I. Each chamber is rated at 3,300 lb thrust. Turbopump assembly was separate unit and is not shown here. Overall dimensions of the assembly shown: length, 73.3 in., width, 24.4 in., height, 34.4 in.



SEPR 66 rocket powerplant developed for Dassault Mirage, shown in a single-chamber unit designed to be attached to a packaged powerplant. Thrust of the engine is 3,300 lb. Dimensions: length, 13.02 in., width, 23.6 in., height, 11.5 in. Weight of the unit including all accessories, is 300 lb.



FIRST FRENCH liquid-propellant model to power an engine was the SEPR 25, a 3,300 lb thrust unit. Engine was driven by shafts from the main turbojet powerplant of the SO 6025 Epsilon test vehicle. Package length of this engine was 60 in., with a 20.5 in. and height was 17.4 in.



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less. Total time for the starting sequence is about five seconds.

For ultimate simplicity, jet pumps are brought into use. These are installed as part of the tank valves and down stream of the tank. Jet pumps are driven by a primary pump acting as an ejector and coming from the main fuel pump. The pressurization operation of the fuel feed pump prevents cavitation at startup.

Since the beginning of the year, the SEPRA 66 now has been fired more than 3,000 times both in flight and in static tests on the ground.

SEPRA 481

The engine, designed for the T-28B-1, is considered only a prototype unit. During its development program it was fired up 1,200 tests in two and one-half years. Most of these were ground runs but 100 were flight tests. Combustion chambers were fired approximately 1,700 times during the period.

The SEPRA 481 has all the outward signs of a prototype engine, its packaging is not nearly so neat as the later models. In addition, the engine was made in two separate components at the request of Sud Aviation. The turbine pump assembly was separated from the main body of the engine and is not formed in the fuselage in the shape of the wing trailing edge.

Because of the "hedgehog" nature of this engine, the specific impulse is lower than most jet engines, and varied from 155 to 190 seconds at sea level to a maximum of 265 at above 15,000 ft.

Weight of the combustion chamber assembly was 216 lb. and the turbo pump component weighed 206 lb. Its clearance accounted for another 60 lb.

Starting sequence and operation of this engine was handled the same as those described earlier for the SEPRA 66 engine. But with the three chambers the technique called for step firing. Chamber 1 was ignited first, usually at 10,000 ft. and then immediately shut down. It was lit again at about 20,000 ft. and then combined. Second chamber was cut in at about 15,000 ft. and the third at 40,000 ft.

Shutdown Procedure

Shutdown was the reverse procedure when the first chamber was cut off the rocket propulsion automatically went through the complete shutdown cycle.

SEPRA engines start life in the design office and laboratories at Villupatt, a suburb of Paris. The installation is in the Manufacture des Harcours Region one of the old forts built in World Wars.

The first rocket engine test stands were located here, firing through the chimney of old storage vault built



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The moment rotation of any wheel begins to drop at an abnormal rate, a tiny sensing device on the wheel hub

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GIVES PILOT FULL CONTROL

This is the first system in which the pilot maintains full control—and full "feel"—of his braking at all times while having complete knowledge of what is going on in this hitherto "blind area of trouble."

Brake? There is no varying. Flat spotting, of tire and wheel locking caused by pilot inadvertent overbraking is virtually eliminated. Aircraft "down time" is avoided. Maximum safe braking can be applied and landing gear safe instantly decreased.

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under the gaseous platform. No large thrust sockets were tested here, but even so the proximity of apertures and losses has forced SEPAC to shut down this facility in the air test facility.

Probably the test run was made during the test to Villaluz. Component test work continues here, too, but mostly for pump, turbo pumps, injectors, electrical and electronic work, engine tests, cold chamber tests and a "plunger" rocket stand where the force function can be studied for a brief instant in the transient chamber of a plunger rocket.

SEPAC's main test facility is at Melus Villaluz, engine flight and experimental station near Tula used by the Russian and American manufacturers alike. Only liquid-propellant rocket work is done here. The availability of aircraft is nearly impossible under the test of SEPAC and engine technicians center in the making of the rocket engine in the engine.

There are a total of about 28 test stands at Melus, all arranged for horizontal firing. Some of them have been designed so that the engine can be tested in a variety of attitudes, from horizontal to vertical and inverted to check the system functions at expected flight attitudes. There is an altitude chamber at Melus that permits firing of rocket engines under simulated altitude conditions.

Solid Rockets

About 10% of SEPAC activity is built around the solid-propellant rocket used both as a booster and as a sustainer.

First studies along this line began in 1971, several years after the liquid-propellant work was well underway. First test was made on the stand in 1972, and the first flight test of a solid SEPAC rocket took place the following year.

Current line of booster rockets runs between 100,000 to 1,000 lb wt and 250,000 to 100 ft.

Present of these is the SEPAC 712 with a thrust of 40,000 lb and a diameter of 4.5 in.

Design and other studies of the solid-propellant rockets are done at Villaluz. Fabrication of the cases is done at the Agroprom factory and loading and testing is done at Tula.

Powder used in the rockets is supplied by the French government, which retains a monopoly on all powder production, development and production.

Chemical Developments

Any rocket firm using concentrated acid as an oxidizer is faced from the start with some ancient problem of corrosion of the engine and its components. SEPAC was no exception, and early in the game, began chemical research to develop some kind of an in-

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 electronic research corporation
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First dissipating tube shields for monomers, subminiature and power electron tubes



B-58 Supersonic Ejection Tested

New action of Convair B-58 Hustler bomber tests supersonic ejection of three-man crew using ejection-seat ejection. Rocket-powered sled developed more than 300,000 lb thrust to propel the rocket down the 4.1 mi track at the Supersonic Wind Tunnel, Rosamond Thrust, Chino Lake, Calif., the only track in the country long enough to handle the test. Sled, fired by 4,500 lb. thrust rocket catapult, is thrust slightly downwind to boost deceleration sled. B-58 ejection is launched and propelled down the track. Water trough (top) brings sled to safe stop.



leisure to eliminate the extremely low course action of water and

The result of the research is a new phenomenon derivative called Oxidation. Extended life tests have shown that this inhibitor protects metals and light alloys of copper and magnesium at room and elevated temperatures. One specific example is a pump rotor assembly which is an intricate weldment, one month in test produced no weight reduction of the part.

Oxidation is added to the acid and is not a chemical treatment or coating for the material itself.

The company got its start through the catalyst of cat man, its present technical director Perceval Flinn. A graduate of the Royal Engineering of Administration, Flinn is a young officer in the Army who was sent to Germany at the end of the war to study rocket development. Impressed with what he saw there, he came back and started work.

First of the SEPA rocket tests were in person work, and the early four-year tests were difficult as he and a few technicians labored to produce up to 100,000 and reliable rocket engines.

Within a decade the company has grown to a total of 990 employees working in a plant area of 124,000 sq ft in Fort Belvoir.

Financial support for the development work comes from the French Air Ministry. Capital of the firm was supplied in large measure by these organizations. Societe d'Electro-Chimie d'Electro-Metallurgie et des Aeronautiques d'Ugine, Sud Aviation and Air Liquide. Part is the largest investor.

SBAC Lists Aircraft For Farnborough Show

London-Britain's F13 supersonic fighter and possibly the SR-71 aerial reconnaissance interceptor will be displayed at Farnborough an exhibition next month, the Society of British Aircraft Constructors said.

These aircraft also were on a list of the society's planned flying display.

The Wessex turbine-powered helicopter, AgustaWestland's helicopter, the Harrier II, the M. 165 light transport, the M. 200 Student jet, the Hawk II, the V. 1000, the Canberra B.8, a Hawker Siddeley with a general thrust device, a Britanni fitted with an Orion, a Proteus T55 and two T55s, an Olympus Canberra, and the Scorpion tank.

Also a Shadow helicopter fitted with Napier turbojet engines as its sole source to increase rate of climb or perform in hostile climates. Whitworth, Westland, Saunders, a new engine, Bristol T55 and Puma helicopter.

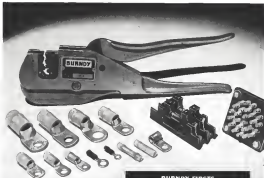
Also Convair T11, Twin Power, Heralt and Farnborough transport Jet Pro, jet engine, Hawk light fighter, Hawk 50, 7-11, Hercules, P. 7 and M. 1, 6 Hercules, Royal Navy's N. 113 Sea King and OH-119 Sea King, two V. 1000s—the Victor and jet engine, the V. 100, the P. 14, the P. 12.

Now, again, but both to be shown include the Spectre-Canberra, Concorde, Concorde and Concorde Volo.

Pachmayr Acquired by Airtex Dynamics, Inc.

Pachmayr Corp., manufacturer of aircraft components and supplier of heavy machinery, aircraft structures, has been acquired by Airtex Dynamics, Inc. Both companies are located at 2222 S. Tigress St., Los Angeles.

Pachmayr will operate as a subsidiary of Airtex and will continue manufacturing its equipment, with emphasis on expanding its aircraft machining department and battery of Hydrolics.



FIRST

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CIRCUIT SAFETY

YESTERDAY—Many of the most important technical developments in direct electrical service systems were suggested by Burndy engineers working closely with the aircraft industry.

TODAY—Burndy terminals, current limiters and disconnect panels are specified for use in nearly every modern aircraft, military and commercial.

TOMORROW—Products now under development at Burndy will help make future planes still faster, lighter, safer.

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- A—Manual installation tool for all disconnect terminals. Pat. 3271.
- B—Crush multiple disconnect terminal into flat disk. Pat. 3284.
- C—Shield type cable hanger. Pat. 3272.
- D—Prepositioned threaded disconnect panel. Pat. 3271.
- E—Complete line of compression terminals from 4/16 to 3/8". Pat. 3271.
- F—The best compression terminals. Pat. 3271.
- G—Insulated compression terminals from 1/16 to 3/8". Pat. 3271.
- H—Insulated aluminum compression terminals from 1/16 to 3/8". Pat. 3271.
- I—Locking for current production. Pat. 3272.
- J—Under development.

Note for specific details.

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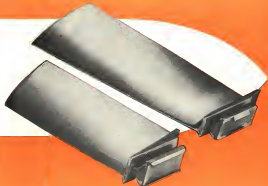
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Make the Jet Division a part of your missile production program. By having us produce forged and machined parts and weldments, you avoid the capital expense of your own facilities, eliminate the headaches of recruiting trained personnel, get your missile program under way faster.

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which describes the engineering and production
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The complex requirements of missile and guided aircraft must instantly direct elements of ground support equipment, in the field, CONSOLIDATED has developed a wide range of rugged and multipurpose units designed for both machine and pilot control. The compact Model 100, for example, a self-contained multi-purpose unit performs every function of electrical hydraulic and pneumatic testing... is capable of servicing and starting ground machines and of air craft quality, safety and seals the most difficult operational problems... and can be used for heavy duty testing as well. It provides:

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MISSILE ENGINEERING Guidance, Production Details Show Simplicity of Fireflash

By John Tustall

Launch—Engagement and control details of America's first fully operational Mach 2 guided missile system—the Fireflash—were completed last week during a tour of a pilot production line at Tracy, America Co.'s Weapons Division in Houston.

"In spite of preceding design problems 100 hours more complicated than we've done," Development Chief L. R. E. Appleton said, "Fireflash went on to a production line after only 14 hours test firing."

Weapons System

The Paper airplane missile headsets a radar beam led on the target by a parrot aircraft equipped with a target processor-to fire computer. Radar and gun sight are synchronized so that accuracy of the weapon depends solely on ability of the pilot to track the target with the wings in the center of the sight picture.

The weapon consists of an unpowered conventional winged dart mounted to Mach 2 in two solid fuel rockets. After separation, the dart coasts under downwind control from base fire directed at 45 deg. to the wing cradles.

During the boost phase, the missile is supported and is spun with fins locked in offset position to counter thrust asymmetry. An explosive shear point cylinder breaks block, and to sense motion causes that the rocket nose against each other during separation leaving the dart together until fuelled. Rocket units are fired to ensure safe disposal.

Booster Separation

At separation, when combustion pressure drops to 210 psi (10:1 the first unit is ejected and the missile becomes self stabilized by control deflection about a datum established at launch. Points where the rail nose joints are established, however, commands are applied into the control block. Rotation of nozzle to base is measured in polar coordinates, interpreted as Cartesian linear axes and resolved into roll and pitch planes.

Three core signals are then fed to electro-pneumatic valves serving the pneumatic actuator pistons to which the fins are connected. All four fins are independently moved and are not mechanically linked. During the

control gathering phase, clamping devices retract the maximum allowable lateral loading. Design loading for the missile is believed to be about 10G; design nose loading is about up to 10G.

The missile disassembles into two major assemblies—the rear dart cylinder containing all power, control and guidance equipment, and the explosive warhead which contains the two rockets, separation gun, warhead and fuse. Both assemblies are mated together and are secured by an internal ring nut and key.

Almost complete absence of machining in the weapon structure illustrates the simplicity, elegance, ease of maintenance, interchangeability, and assembly. The dart body is basically an extruded rectangular aluminum alloy 7075 in length, with one splitting and internal tapering, tapering operations at the wing root and at the forward bearing and has a reinforced cut at the wing bearing platform, and joint bay.

All the wing and fin vents are enough light alloy forgings machined out of bones and wing platforms and all are interchangeable.

Rocket nozzles are straight section steel machined forgings.

Control and Guidance

Two hollow extruded fins from a single extruded channel which houses the control and guidance mechanisms in the dart tube. They also act as hot air and wing pylons.

In order from the fin forward are pneumatic actuators with four pairs of pneumatic valves and four electro-pneumatic valve solenoids regulated electronic control and guidance elements and power supply, although pneumatic valves are used for the fin deployment and two rate gyros, two inertial accelerometers, a 1000 psi air branch with internal reducing valve (100 psi). All of the fins is an axial section.

Points of special interest:

- **Fogged light** allow homogeneous no bottle catches the radiation valve, using considerable space without overlapping cable design. The valve has considerable length but does not exceed reach volume.
- **Two angle** allow pistons work a single work mechanism which rotates the fins. Each piston is moved by an electro-pneumatic reducing valve and the separate control of four such



LOW TEMPERATURE tests are carried out on Fireflash in Tracy's cold chamber but has covered first stages of missile.



BOOST system separation results are checked (top) after controlled test and load stress. Turbo-chamber (below) illustrates effect of diving into an exposed closed environment.



from each independent valve and cylinder are the most precisely regulated units in the weapons, being held together to tolerances of 0.0001 in. The pistons have rubber rings sealinging rotary rings which have extremely low friction coefficient and are self lubricating.

Size Reduction

That size has led to considerable size economies during the development period and resulted in better size reduction of over 90%. A pneumatic rotary drive means that the pistons are unlubricated when the booster separates. Air supplies to the guns are provided

from the aircraft's engine, compressed and after wrapping the guns could fire position fixed back, is transmitted from carbon arc potentiometer output to the fire.

• Fire's patented X and Y rate gyro meters measure rates which produce an a/c signal in push-off mode. Their output is attenuated in deployment of the guns against a torsion spring actuator with fixed damping. Acceleration rates are then type supported down to zero springs fixed damping and zeroed. Deployment is transmitted from a second potentiometer output to the guns.

Roll displacement potentiometer is

specific speed. An extremely simple and inexpensive single factor cost and size arrangement enables both roll gyro rates to be included for testing.

The rate gyros have speed measuring devices which compensate for distortions of the gyro during the loading period.

• Guns are performed and tested before mounting to the pointed and capitated elements. There are six true tubes. Fifty of the weapons has been to keep registered and down and have large numbers during the endogenous period. Large units are two-eyed but Aquilina said. When you have a unit working as well as this does you



marion
ELECTRICAL
INDICATING
INSTRUMENTS

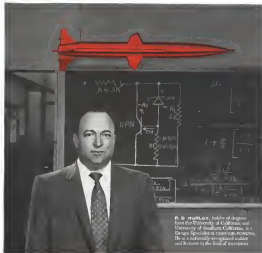
WHERE ELECTRONICS MEETS THE EYE

marion electrical instrument company
Brooklyn, New York



INERT Fireball knocking off target and solid is photographed by high speed camera.

AVIATION WEEK, August 26, 1957



R. B. HANLEY, holder of degrees from the University of California and University of Southern California, is a Design Specialist at CONVAIR-POMONA. He is a nationally recognized author and lecturer in the field of electronics.

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"Here at CONVAIR-POMONA, we are constantly studying ways to apply the new amazing solid state electronic devices: the diode, rectifier and transistor. So now is the semiconductor future, and so vast its future—both for the military and industry—that our teams of electronics engineers actually 'go to school' under some of the foremost experts in the field.

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electronic devices in the next few years. And you can readily understand the advantages of studying and working with these devices, guided by the advanced thinking you will find at CONVAIR-POMONA.

"You'll like the atmosphere here, where you are and feel accomplished. And you will enjoy living in Southern California's beautiful Pomona valley. For greater career opportunity—for your future's sake—ask for more information about CONVAIR-POMONA today! Write to: Engineering Personnel, Dept. 5-E."

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World's Only FLYING FINANCE OFFICER

The Army Aviation Center, Fort Rucker, Alabama, believes that its 1st Lt. William DeLoe Smith is the world's only Finance Officer with wings.

This seeming paradox came about when 1st Lt. Smith, after earning an airframe commission in 1962 and qualifying as an Army Aviator, saw active service in Korea and then applied for a Regular Army Commission. Because of his civilian experience in a bank, his commission was issued in the Finance Corps.

That, however, did not deter 1st Lt. Smith's flying ambitions for he went on to qualify as a Rotary Wing Pilot. He is now a helicopter flight instructor at the Army Aviation Center, Fort Rucker, Alabama—one of the enthusiastic group of officers responsible for seeing that Army Aviation receives full value for the \$60,000 estimated cost of training each Helicopter Pilot.

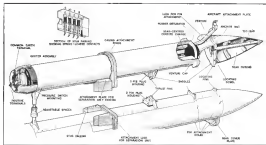


Helicopter flight and mechanical training are available to qualified personnel at the U. S. Army Aviation School, Fort Rucker, Alabama.

Watch "Whirlpools" on TV—consult your local paper for time and station.

FORT WORTH, TEXAS

MANUFACTURED BY
BELL AVIATION CORPORATION



BOOBY ROCKETS for Fordite are shown in section drawing. Solid pyroclastic fuselage separates when combustion pressure falls to 150 psi and reassembles after contraction on its target. Made in a loose mold.

don't rush in to change things all at once."

Toting Equipment

The company is enthusiastic about missile testing and collection equipment which was completely integrated into the design and production planning from the outset.

At the factory, a multiple battery of consoles provides facilities for the complete collection of the whole missile power and guidance system, with warehouse conditions simulated.

At all operational air fields, a single console has been especially designed which reports all the production tests on a go/no go basis in 15 sec. Now

technical operators can be transferred with the console in under two hours. Right at the start, weapon modules have been put in hand so that a practical console could be designed compatible with the test requirements, with minimum technical apparatus.

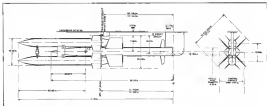
The traffic on which the weapon is finally assembled before flight would be transported the missile to the wing station and trace it into position.

Fares and Countermeasures

Next, close the weapon to ramming into the target, countermeasures on a basis of a time to reach and weight possibly imposed on enemy jamming aircraft. It is believed that the pro-

cedure is not dependent on a fixed trajectory distance, but explodes when the missile reaches the separation distance in approaching the countermeasures. The missile drops explosives as early as 100 yds off the target. Tests have shown that an evading aircraft is a more vulnerable one because it presents a greater surface area.

To ensure component compatibility at the earliest possible moment under all conceivable circumstances and at one part of the world an extensive test laboratory has been available throughout the development history. Facilities include two 5 in. ft. shocktubes, class B test operating history, -10G and -51 deg. 130/75 humidity and under

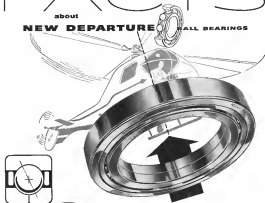


SIDE AND FRONT VIEWS of Fordite gas rocket show downing. After separation, control section, indicated at 47 deg. in wing members, guide weapon to target. During launch phase, missile is reassembled and is open with fuselage locked.

FACTS

about

NEW DEPARTURE BALL BEARINGS



New Departure split inner ring ball bearings are made in a range of sizes with and without inner ring roller grooves indicated in the exploded view above.

LOADS GET A LIFT with THIS BALL BEARING

Whether in helicopters or jet engines, New Departure ball bearings of split inner ring type provide very high load capacity. That's because the separable rings permit high race shoulders and a greater number of balls of large size. These split inner ring ball bearings not only carry heavy thrust loads in either direction in addition to radial loads (with thrust predominant), but they have important application advantages.

Since both the inner rings and separator-ball assembly are removable from the outer ring as individual parts, the bearings are easily inspected or cleaned. In addition, installation is greatly facilitated.

Send for Folder TB listing sizes.

BALL BEARINGS MAKE GOOD PRODUCTS BETTER

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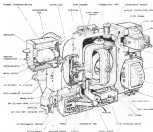


TEUFEL VEHICLE (TFV-11) was one of 400 models used to develop mechanisms to separate wing-mounted boost rockets from aircraft.

very high stresses. A number of other service chambers are experienced, but service cycles life testing conditions with associated fatigue and lubricating oil residues, and dust and thermal runs. Other climatic facilities include ultra violet and ultraviolet light loads. Vibration equipment includes tests up to five kv output, a variety of vibration transients, calibration support tests, including together with a conventional battery of structural test rigs.

It was evident from certain components at the plant that the missile has passed through at least four prototype phases, which would seem to confirm the company's policy claim that the missile is such as to prototype phases could or was produced in a fully open form.

Missile dimensions to nearest inch: Overall length 18 ft, wing span 35 ft, length of air 89, rocket nose had diameter 12, rocket 63, rocket 12.



CONTROL INSTRUMENT assembly (above) contains two coil guns, one roll displacement gun and a lateral accelerometer. One lateral accelerometer has been defined for development of two boost rockets from conventional short (right) is tested with loading for protection. Explosive twin piston cylinder bench (left) used to remove rocket is fired to accomplish separation.



19-003



Giannini

11-02-0001



Giannini



TEXT INCH SPREAD similar to one that will be covered in a Vinyard text filing is prepared for vibrating text. Six rectangular objects on surface house six buttons.

Washington-Navy Vanguard test vehicle being reported in the near future. If it is successful, it will be followed by four test firings of complete three-stage rockets.

Test vehicle due for immediate firing, designated TV-2, consists of a prototype first stage of the first Marlin Vanguard launchable vehicle.

It includes General Electric Co. first stage engine and luxury second and third stage.

Defense Department has denied reports that an attempt would be made to launch a smaller satellite in the next set of four flights of complete Vega ground vehicles in order to orbit a spinoff of the Soviet Union, which shall be a satellite program.

But it left open the possibility that the 6-4 or megawatt spheres be carried to the four three-stage test vehicles or spheres carried in later test vehicles, weight and size as an orbit.

Splines planned for the next series of low test shots will carry antennas and Miniduck radio transmitters powered by solar batteries to permit tracking stations along the test range at Patrick AFB, Fla., to measure vibrations both before and after the spheres are released.

Glycerine is engineering data on performance of the launching vehicle and the payload component. Delivery and

not an end). Fewer test instruments will be used as test objectives are met.

The decrease in payload weight will allow an increase in rocket velocity, "but it is highly unlikely that an existing missile will be achieved during the test phase of the project," Defense Department said.

Although the theoretical possibility of obtaining an orbit has existed throughout the planning of the two parties of the project, the department said "it is only incidental to the objectives of the test program" which is to develop a capability of launching a 20-in. instrumented satellite undersea during the International Geophysical Year.

Swift Program Again Criticized by British

London—Another government committee has visited Britain's system of making aircraft procurement, this time concentrating on the Vickers Supermarine fleet.

The Comptroller of Public Accounts said expenditures on the South, amounting to about \$112 million had been "largely absorbtive." The statement was rebutted one earlier this year by a House of Commons Select Committee.



almost spaceless...almost weightless

Developed for the Vanguard Earth Seaflo, the potentiometer output transducer provides a high level output proportional to absolute, differential or gage pressures to 30 psi. Resolution is better than 500 wires (18.25%) and would be less than 10%.

For full details, please write Ben Dale, M&M

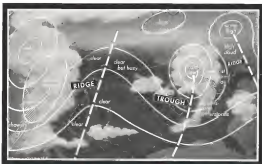
No. 41754, 184: *Salix Asch.* *Fraxinus Fraxinosa*

Giannini

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FLY WEATHER-WISE

These weather forms prepared in consultation with the United States Weather Bureau



CIRCULATION PATTERNS

Clockwise circulation of air around High Pressure areas and counter clockwise flow around Lows in the northern hemisphere are well known to most pilots. However, there are some lesser known features of High and Lows which have become apparent with the progress made in upper air analysis.

Warm Highs—Extended to levels above 10,000 ft with temperatures generally warmer than Standard Atmosphere. As this type of High extends farther aloft, it often assumes an elongated shape with major axis lying N/S to form a Ridge. This Ridge actually moves very slowly, blocking or guiding movement of weather systems

at lower levels, often causing prolonged periods of hot or mild weather in adjacent areas. Weather in warm Highs is usually dry but not overly hot.

Cold Lows—Extended to high levels with temperatures generally colder than Standard Atmosphere. Their normal associated movement slows and sometimes the center shifts becomes stationary as even more cold air would. This is called a Cold Low because of concentration of cold temperatures near the center. V shaped elongation of these Lows toward the south is referred to as a Trough and marks region of wind shift and possible clear circulations.

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on September 14th (ENR p. 34).

"The expenditure of 40 million pounds should have been largely shown in that it has produced no result for the operational role which the Swift was originally intended to fulfil," reports the Committee of Public Accounts.

Even the fourth Swift model, the committee said, "could not be relied on at altitudes at which it was supposed to operate, and would not therefore be efficient in the interception role for which it had been intended."

The Swift was scheduled for operational service in 1935, but that last three years were not considered safe for high altitude testing.

When the fourth model was delivered in 1934 it was tested at height and found to have "bad maneuverability." As a result, contracts for 492 Swifts were not let in February, 1935, in 178 aircraft, including prototypes.

At that time, the Royal Air Force had 30 Swifts.

The committee said the Royal Aircraft Establishment had forecast in December, 1933, that design proposals for the Swift would lead to aircraft with certain delays in performance and had suggested various corrective measures.

Some of these changes were adopted but they proved insufficient to correct the main defect that had been forecast, poor maneuverability, at altitude.

Ministry of Supply was advised by the interim committee that any claim for breach of contract had been irreparably damaged by acceptance of prototypes and a number of production aircraft.

The Committee says it "doubts" whether the government's financial and technical control over four years of Swift development "was clear enough to ensure that work was carried out as soon as possible."

Stating that it is "disagreeable and speculative" to place production orders for a new type of aircraft on which full production work has not been carried out, the committee recommended

that in the future the government specify more requirements for aircraft in sufficient detail to "place on the contractor responsibility for meeting them."

The committee noted that the Air Ministry had complained about the amount of information given by the Ministry of Supply as the behavior models that have been experienced with the Swift.

It recommended that the Air Ministry hereafter should have full access to all authorized reports on progress and full information about plans prepared to bring aircraft up to the standard in question.



This device installed in Edo's Automatic Command system as fully display in radio of use among other pilot airplanes.

EDO LORAN

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Edo Airborne Loran has been charting back and forth across the Atlantic for the past six weeks giving completely satisfactory service, and guiding navigation information. Edo's reports range from "Edo's" to very high evaluations.

Edo, with its compact design and extreme low weight, gets Loran in the cockpit, gives the pilot directly and fast of positive information as simple as with any other point-to-point radio navigation device. Edo's major advantages, compactness, economy of Loran's time-proven accuracy and economy by the simplicity and weight of new proposed systems, have convinced that the lightweight Edo Loran is already being designed into the instrument panels of the Boeing 707 and Douglas D4C-1 jet transports.

COMPACT CONTROL
with measures 10" high
24" wide, 4 1/2" deep
for single installation
Total weight is 28 pounds
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Systems engineers can now gain simplicity and better performance in torque synchro systems by using new synchros developed by Norden-Katzy for the Bureau of Ordnance. The unique design reduces size by approximately one-half while increasing torque 2 to 3 times in comparison with standard MD synchros. By performing interchangeably as Torque Transmitters and Receivers, these synchros offer the further advantage of system simplification. This new development by Norden-Katzy extends the capabilities of the systems designer to achieve beyond previous limits of performance.

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1 to 3 times previous rail spacing values.
- **Higher Electrical Accuracy** —
See 110 $\pm 0^\circ$ compared with $\pm 12^\circ$ (M4)
See 110 $\pm 3^\circ$ compared with $\pm 8^\circ$ (M4)
- **Multi-function Versatility** —
Torque and Accuracy values exceed M4 torque transmitters and receivers. These synchros can be used interchangeably in both functions with improved system performance.
- **Greater Dynamic Accuracy** —
Higher output provides motive error of $\pm 10^\circ$ max. throughout the life of the unit.



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FUNCTION	MODEL	NEW 80C10 FUNCTION BLOCKS	STANDARD 80C FUNCTION BLOCKS	NEW 80C10 FUNCTION BLOCKS	STANDARD 80C FUNCTION BLOCKS
INTERNAL TRAP TIME		100000	100000	100000	100000
WAKE		1	10	11	10
Number of Flows	1	1	1	1	1
DECRIMINATE PHASE		None	None	None	None
FREQUENCY	cps	400*	400	400*	400
WAKEUP RATIO	ratio	113.70	113.70	113.70	113.70
Maximum Input	CURRENT POWER	0.10 2.0	0.15A 3.0	0.10 2.0	0.10A 2.0
INPUT IMPEDANCE	ohms	100000*	100000*	100000*	100000*
FUNCTION SIGNAL AT 80C10	on to	0.00	—	0.00	—
ELECTRICAL INPUT WAKEUP	seconds	0.00	— 0.0	0.0	0.0
RECEIVED ERROR MESSAGE	degrees	113.0	113.0	113.0	113.0
RECEIVED CRASH/RECOVER	on to sleep	0.10A	0.10A	0.10	0.10
STARTING TIME, WAKE (1000)	seconds	0.0	0.0	0.0	0.0
OPERATING INPUT RANGES	°C	*0.0 to 100.0 (Available on model order to 0.00° and 100.0°)			
INPUT	°C	0.0	0.0	0.0	0.0
MAX. TEMPERATURE	100.00	100.00	100.00	100.00	100.00

*Although these models are rated at 100 cps, they are available to your order to operate at any frequency from 400 cps to 10,000 cps.
Data at extremes of temperature available upon request.

^aAlthough these antennas are rated at 400 cps, they are available to give input to speeds of any frequency from 400 cps to 10,000 cps.

Date of acceptance of manuscript available upon request

AVIONICS

How the Router Operates: Part II

Maser's Potential Rests on Further Work

Re Dr Richard W. Hanson

Increasing price of research on atomic amplifiers, spurred by these potentialities for improving solar concentrators and communications equipment performance, has already produced a variety of techniques and experimental devices.

The authors welcome any other ideas because they operated on the principle of Microwave Amplification by Stimulated Emission of Radiation. Although more recent devices operate on slightly different principles the term Maser is sometimes applied, although perhaps it is simpler to use a better generic term.

Low-Midline Level

All of the devices and techniques show a common advantage: extensive low-cost level compared with existing microwave tubes. Although carbon fibers need a gaseous medium, present emphasis is on solid state materials. Solid state devices emphasize efficiency both in the structure of materials employed and the technique used to supply energy to the device for subsequent extraction as an amplified wave.

The two-level, or paired, Mosey is a solid-state device that uses a paramagnetic salt such as cerium nitrate or copper Tutton salt. The name is derived from the fact that its operation is based on the use of two energy states of the spinning electrons, which behave like tiny gyms with a magnet attached. This explains why the two-level Mosey is sometimes called a gyromagnetic resonator.

The paramagnetic crystal is placed in a constant static or smaller microwave magnetic field and exposed to the incoming microwave signal to be amplified. The signal produces a polarizing magnetic field that interacts with the paramagnets. In addition a d.c. magnetic field is applied at right angles to the polarizing (signal) field, its strength is selected to make the gyro magnets in the crystal resonant at the frequency of the microwave signal.

Crystal Inversion

To obtain amplification, the crystal's gain magnets must first be excited to increase their internal energy. One way to accomplish this would be suddenly to reverse the polarity of the steady magnetic field. The consequences would



FORWARDED SCATTER. Commercialization will be one of the first applications of the extremely low-angle characteristic of charge transfer.

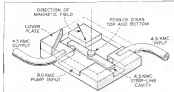
them seek to align themselves with the new field polystyrene, requiring a 180-degree shift of spin axis. The time required for this reorientation is called the spin-lattice relaxation time.

During approach half of the stimulus interval, the pre-magnet gets up close to the pulsing magnetic field, producing amplification of the signal. (This magnet disappears on very exponentially with time, much like a capacitor discharging through a resistance.) During the last half (approach), half of the stress is transferred onto the pre-magnet product, so signal amplification has instead already started from the onset time. When

the grass crops have reached equilibrium position, the straw crops field can be released again to repeat the pasture cycle.

One of the limitations of the two-level Mauns is that gas can be obtained for only a part of the total operating cycle and increased gas is obtained at the expense of lower Mauns data cycle. Possibly this limitation can be circumvented with new electrical techniques which permit adjustment to be shortened following the useful simplification portion of the cycle, but considerable work remains to be done before this can be achieved.

Reversal of long magnetic fields at



ONE TYPE of magnetic amplifier is shown schematically (left). One of the three can be seen from picture at right. Amplifier pictured was developed at Bell Telephone Laboratories.

extremely high rates in other expensive in terms of power and there are more intricate ways of achieving the same effect. One, for example, called subharmonic but pumping, uses the second source of sinusoidal energy into the same magnetic circuit; the second source is said to be amplified. The second source produces a strong radio frequency field on the crystal and produces energy required for amplification.

If the frequency of the second source is rapidly varied from slightly above to slightly below the frequency of the signal to be amplified, the effect on the parasitic gain is essentially the same as reversing the polarity of the d.c. magnetic field and therefore produces the desired gain inversion. In a typical application, a second source of a few volts is swept through a change of about 10 mc in several microseconds. This in turn and more convenient than reversing the d.c. field.

180 Deg. Pulse

Another pulse extension technique called the 180 deg. pulse method, also employs a second source of sinusoidal energy instead of varying (sweeping) the frequency of the second source, it is applied for a time equal to opposite while another the open circuit is used, the latter channel when the radio frequency power level of the second source. Typical values are about 100 volts RF power applied for a few microseconds.

Disadvantage of this technique is that the three gain and efficiency suffer when the product of radio frequency field strength and pulse duration are properly considered. The two techniques suggest about the same amount of RF power, but the subharmonic first process method allows much greater tolerance on field strength and frequency of the second source. For some applications the 180 deg. pulse technique may be useful.

Operating properties of the two-level Magnet in point-to-point applications can be predicted quite accurately from known properties of the parasitic circuit and following are some of the significant operating characteristics:

- Operating frequency ranges from 100 mc to about 10,000 mc, tunable by changing strength of steady magnetic field.
- Reluctance time, which determines maximum pulse rate, ranges from less than a microsecond to a minute or more, depending upon material used and its frequency.
- Materials with long relaxation times usually have low parasitic gain concentrations and hence are useful in power output.
- Materials with relaxation times in microseconds to fractions of a second are quite suitable.

- Gains of 10 db, with bandwidths of 10 mc, or 15 db with 1 mc bandwidths appear feasible with known materials when operated at liquid helium temperatures.
- Gain-bandwidth product is essentially constant. However gain decreases rapidly with higher temperatures and operation at room temperature appears unlikely.

- Noise figure for two level parasitic Magnet operated at room temperature is about 10 db, compared to 6 db for conventional magnetic amplifier. But when cooled to temperatures of 77K (liquid nitrogen), noise figure is only 3.1 db, and it is only 0.95 db at 4K (liquid helium).

The foregoing noise figure means that the Magnet is shielded from thermal isolation required by other ceramic elements through use of a non-reciprocal device such as a circulator or isolator.

Of course lower level of noise noise figure is not by spontaneous emission of radiation that occurs at zero ohms refers to equilibrium. For example at an operating frequency of 10,000 mc, spontaneous emission produces a noise figure of 0.087 db, which can not be



eliminated even if the Magnet were cooled down to a temperature of absolute zero.

For continuous-wave (CW) operation, another type of device called the three-level Magnet, is under investigation. It is more restricted in the type of parasitic materials which can be used and its range of operation differs from the three-level device described previously. (The CW Magnet can be gated for pulse operation also if so desired.) The properties of the three-level Magnet resemble those of the two-level device except that the maximum low duty cycle for amplification is decreased and some response in gain can be achieved with suitable materials.

Three Level Magnet

Using the previous mechanical analogy, the three-level Magnet operation can be explained on the basis of two intercoupled gain magnets instead of the one in effect in the two-level Magnet operation. Superimposed magnetic fields, at continuously fed into one of the two coupled gain magnets. This energy is internally transferred to the second gain magnet in such a way as to continuously maintain it in the excited state so that it has energy available for amplification.

The application's inherent simplicity, supplied by an external exciting, is comparable to that used in the subharmonic low power and 180 deg. pulse techniques, but is supplied continuously in this case.

The choice of materials for use as a three-level Magnet is not as wide as for the two-level device, but a variety of suitable parasitic materials are known. Operable Magnets of this type have been constructed using different crystals of hydroxy fluorapatite, crystal silicon and under irradiation of potassium dichromate solution operating at liquid helium temperatures.

Many investigations of three-level

The skies are full of J-M Clipper Seals

Protecting bearings in many types of aviation mechanisms

Johns-Manville's precision-molded Clipper Oil Seal acts as lubricant and exclude dirt. These seals have a dense asbestos-reinforced heel and a non-flexible lip concentrically molded into one unit. This unique construction provides maximum sealability, low torque, easy installation, long life and wide adaptability. Some of their applications include:

In Actuators—In the worm gear drive of hydraulic actuators, Clipper Seals prevent oil leakage at shaft speeds of 2 to 5000 RPM, pressures of 2 to 20 psi and temperatures of -60 F to 250 F...with a maximum seal ring of 4 in. (Stitch dimensions used in tandem with specially developed metal) wherever required. Also, Clipper Seals expand to the same costly seal, maintained high performance.

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In Gearshaft Assemblies

Johns-Manville developed a special style seal to prevent loss of an important design-type crankshaft in a poppet engine used in small planes.

In Bearing Mechanisms

High sealability and low friction in high shaft speeds make Clipper Seals particularly suitable for clutch and transmission bearing mechanisms in helicopter rotors.

If you have an oil seal problem, Johns-Manville will be glad to help you solve it. For engineering help and free 20-page illustrated brochure JVC-71A, write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.



Johns-Manville CLIPPER SEALS



ROUGH OPERATOR—Unloading a pop in rough terrain, this Marine Corps Sikorsky S-55 shows its usefulness under field conditions during First Indochina Battle of Quang Binh. The Marine Corps has organized its

own S-55 squadrons, HMR (M) 401, at New River, N. C. The big, two-engine S-55, which can carry 30 men and their gear, is flown as the HH-35-1 by the Marine Corps and as the H-37 by the Army.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS



THE OLD AND THE NEW—One of the last of the Army's males and 40 miles from the 30th QM Co. (Pack) rests a Sikorsky S-55 (Army H-34) bringing in stores during maneuvers near Camp Hale, Colo. The Army has announced destruction of male-engaged units and the creation of new helicopter companies.



MATERNITY MISSION—Facing the stark, a U. S. Air Force Sikorsky H-19 based at Prestwick, Scotland, flew a maternity ill expectant mother from the isolated Isle of Arran across the Firth of Clyde to a hospital normally eight hours away by boat. The mother recovered; the baby girl weighed 8½ pounds.



HELICOPTER HISTORY



FIRST MERCY MISSION

On January 3, 1944, a U. S. Coast Guard Sikorsky HO4S piloted by Comdr. F. A. Buck saw five from Manhattan to Sandy Hook with two cases of blood plasma for survivors of a destroyer explosion. The HO4 made the flight in 54 minutes when other aircraft were grounded by weather and a boat would have taken an hour. The planes was immediately returned to base and stock victims. This was the first of many thousands of helicopter mercy missions.

TO DOWNTOWN CHICAGO—Sikorsky helicopters serve by Chicago Helicopter Airways are now operating on convenient, frequent schedules connecting Midway Airport, O'Hare International Airport, and Meigs Field, adjacent to the Chicago Loop. New 12-passenger Sikorsky S-55s are joining the fleet of S-55s already in service in Chicago. Sikorsky helicopters are also standard in scheduled helicopter passenger service in New York and Los Angeles, and in Europe.



SIKORSKY AIRCRAFT

BRIDGEPORT, CONNECTICUT

One of the Leaders in Helicopter Engineering

Many materials are now under test, which should result in a magnetic shift for use in a variety of frequency ranges. These investigations also are aimed at determining what parameters in the material must be controlled to produce desired bandwidth, gain and power output.

Ferroelectric Amplifier

Within recent months a new type of storage amplifier employing ferroelectric materials has been demonstrated. The device has been called the giant. Major in size, but the name is a misnomer because the principle of operation is quite different

from devices previously described.

Ferroelectricity, like piezoelectricity, is a property which stems from the spin of the electron. Thus it is an inherent difference, however. In piezoelectric materials, only a small fraction of the spin contributes to the net magnetization effect because thermal agitation prevents most of the spins from being aligned in an applied field.

In ferroelectric materials, however, the electron spins are tightly coupled together and act as a unit with the result that nearly all the spins can line up with an applied field. The result is a net magnetization that is very much greater than that of a piezoelectric material.

The difference is so great that the piezoelectric material is usually considered to be non-magnetic. Because the gain of a ferroelectric amplifier is proportional to the total magnetization, ferroelectric materials should be able to provide far greater gain than piezoelectric. Unfortunately, ferroelectric materials do not have the required atomic structure for a three-level, or continuous wave, laser, and other refinements have yet to be made for practical operation under pulsed conditions. This explains why a different approach is required to make use of these materials.

Non-Laser Behavior

Key to this new approach was the observation of a non-laser behavior of ferroelectric materials at high to low frequency power levels. Using the previous piezoelectric concept, ferroelectric materials at low power levels can be employed in the same way as for the piezoelectric material.

This change, or model, fails when the radio frequency power level is large enough to bias the piezoelectric through a critical angle θ_0 with respect to the steady field. At this critical angle, the piezoelectric becomes stuck, and if the radio frequency power level is increased further the radio energy fails to bridge the piezoelectric from its fixed angle θ_0 . Instead the increased energy is transferred non-linearly into other modes of the system, i.e. the ferroelectric sample and the associated microwave structure. (See article.)

The additional energy winds its coils around the piezoelectric about their precession paths, a sort of wobble. This wobble (nutations) of the piezoelectric couples energy from the driving radio frequency source into modes of amplification of the crystal, the cavity or bulb, which are in resonance with the wobble frequency.

It is this energy, extracted from the crystal or cavity, which produces signal amplification.

In one type of ferroelectric amplifier, a source of microwave driving power at frequency F_0 is supplied



PLUG of precession angle versus RF field strength for ferroelectric amplifiers.



"PAPA" The Martin Marietta TN-61-B is the fourth generation of a famous family. As the latest descendant of the first operational tactical missile in service with the Air Force—and the first pilotless bomber having complete interchangeability of parts—the performance, operability and advanced engineering of the Marietta give it top rating in our missile arsenal. Today, this important weapon is one of five major Martin projects in the field of rockets and guided missiles that are under development or in production for the Army, Navy and the Air Force. It was the original Martin Marietta, papa of them all, that launched the new age of missiles in America.

MARTIN
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Why All The Fuss About "FACTORY NEW"?

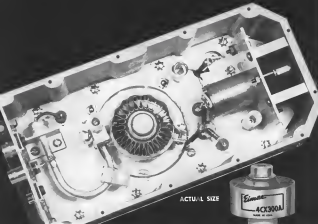


Because "factory new" is your guarantee that the parts have been made by the original manufacturer—that they came from a current production line—and conform to the current specifications for that item. It is the same difference between a bargain basement dress and one of those Paris creations your wife dreams about.

Airwork stocks factory new space parts (almost two million dollars worth) at Millville, New Jersey and at 6 branch offices. Look in the yellow pages for the phone number of the one nearest you.

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Compact, rugged RADIATION, INC. airborne telemetering transmitter features EIMAC ceramic 4CX300A tetrode

Less than 1% amplitude modulation caused by mechanical excitation is raised or 100G, 6 millisecond shocks or at 30G's vibration from 30-3000 cps in the new rugged Radiation, Inc., 30w telemetering transmitter. It is tunable through the 215-245 mc range to 70,000 feet altitude with the same outstanding dependability as at sea level. The amplifier is a space-efficient, too, as illustrated in its actual size photo above.

To meet these environmental, electrical and physical specifications, engineering facilities, Inc., engineers selected the

Eimac 4CX300A ceramic power tetrode for the final amplifier. This 200 watt tube conservatively generates the RF output of the Model A-30231 amplifier with only 5 watts driving power.

The 4CX300A offers the advantages of dependability and performance inherent in the extensive Eimac ceramic transmitting and receiving tube family.



EITEL-McCULLOUGH, INC.
SAN BRUNO, CALIFORNIA
Some Power™ with ceramic tubes that can take it

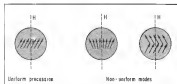
4CX300A RF power amplifier or oscillator
Class C Telephony or FM Telephony

MAXIMUM RATINGS
D.C. Plate Voltage
D.C. Screen Voltage
D.C. Grid Voltage

2500 max. volts
350 max. volts
-250 max. volts

D.C. Plate Current
Plate Dissipation
Screen Dissipation
Grid Dissipation

370 max. ma
200 max. watts
12 max. watts
2 max. watts



DISTRIBUTION of excitation in a klystron-type crystal. Excitation is usually uniform but non-uniform modes can also exist. Two typical non-uniform modes are shown at right.

through a waveguide to a klystron-type crystal mounted in a cavity. A d.c. magnetic field at right angles to the waveguide and with field strength sufficient to cause gyro-magnetron resonance at the driving frequency is also used, as with the paramagnetic mixer.

The cavity is designed to be resonant at two frequencies, F_1 and F_2 , one of which corresponds to the frequency of the input signal to be amplified. The sum of F_1 and F_2 equals the driving source frequency, F_0 . One of the cavity modes must have a radio frequency field component along the d.c. field; the other cavity mode must have a component at right angles to the first.

The radio frequency field aligned with the d.c. field modulates the helix, driving up the gyro-magnets on and out of resonance. Non-linear effect produces additional energy at F_1 , equal to F_2 , or an F_0 which increases energy losses at F_1 and produces amplification (negative resistance) at the frequency.

Thus, when an input signal (F_1) is applied to the klystron-type crystal by means of a strip line resonator in the center of the waveguide, an amplified output signal at the same frequency is obtained. If frequency conversion were desired, an output signal at frequency F_2 could also be obtained.

Room Temperature Operation

One of the most significant features of the paramagnetic amplifier is its ability to operate at room temperature, which opens up entirely new uses for the device. Until such amplifier, announced within the past several months, has been operated at both an oscillator and as amplifier at 400K or more.

A number of different materials, including ferrites and klystron-type crystals, appear suitable for use as such amplifiers, but the klystron-type crystals of the present crystal structure appear ideally suited. The paramagnetic device operates in the non-linear region at room temperature with only about one watt of microwave power when

excited as a straight waveguide, or with only milliwatts in a cavity.

Operating temperatures varied up to several hundred degrees centigrade and down to the lowest temperature attainable. Most important, the desirable linear properties of low noise is achieved in the klystron-type amplifier. When operated at room temperature, the noise figure is about 3 db, but if design is such 0.50 db when cooled to 4K.

Mid-frequency amplification is determined by the strength of the applied d.c. field, like the paramagnetic mixer, and can range from approximately 500 mc to 100,000 mc. Bandwidth varies from about 1 mc to as much as several hundred megacycles. An amount of driving power required goes up in bandwidth to cause gain may become rather large for the wider bandwidth devices. However, it is always less than for a comparable three-level (IGW) paramagnetic single diode.

Larger Gain

Available from a klystron-type amplifier also a much larger gain than in paramagnetic devices because of the greatly increased susceptibility. Ultra-small limitations on the power output is determined by non-linear behavior of the modes at F_1 and F_2 , and corresponds roughly to the threshold power level at F_0 —the power level required to produce oscillation.

Wide bandwidth and high power handling enabled by waveguide gain bandwidth, with the consequent requirement for larger driving power in this type of device, three appear to be no reason power output limitations if one is willing to pay the price in larger driving power.

The gas mixer, first shown amplifier to be proposed and demonstrated in 1951, is discussed here because it is not primarily limited to very stable oscillation (noise) applications. But this should not depress this very important use.

The gas version differs from the



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B.W.F. (Big Bob) Schmidt, Manager, Tucson Airport Authority

There's a team in Tucson worth knowing about!

*Big Bob Schmidt and Shell,
working together at Tucson, Arizona,
Airport have increased aviation
fuel sales fivefold since 1948!*

Seems everything's big at the Tucson Airport—Big Bob, big sales . . . and big plans that are underway to extend the 12,000-foot runway to 15,000 feet, making it the longest in the world!

"One of the things that attracted us to Shell," says Bob, "was the company's reputation for helping dealers grow. We knew there must be good reasons for it. We soon found out. Giving engineering and other specialized assistance to help dealers build for the future is one secret of Shell's position as an aviation supplier.

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What's more, Shell's technical representative is always here when we need him, making our job of keeping our customers satisfied a lot easier."

And at Tucson, customers are satisfied. Pilots know that a Tucson stopover means a lot more than sunny weather. Big Bob gets them in and out again—fast! He delivers the kind of service they need for on-schedule take-offs every time.

Responsibilities fall on Bob Schmidt when he's away from the airport too. Bob is president of the National Foundation for Asthmatic Children, president of the American Association of Airport Executives, a director of the Tucson Metropolitan YMCA, and chairman of the Y's Southside Branch.

Shell is constantly on the watch for men who can build careers to match that of Bob Schmidt.



Corporate plane taxes paid control tower on way to spacious parking ramps. New operations building and inventory tower are under construction.



Big Bob and Shell representative "Nobby" Nubauer stand near built storage tanks discussing plans for still further expansion of airport facilities.



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It pays to be a Shell Aviation Dealer
—and the Shell office nearest you will be glad to show you why



Electronic Counter Measures

misguide the enemy's guided missiles

Admiral develops airborne ECM

You can't count on shooting down a guided missile. The only effective defense against it is some form of Electronic Counter Measures device that deceives or destroys enemy missiles short of their targets.

Admiral has taken the lead in furthering the high priority program to develop ECM. Advanced ECM developments now in progress at Admiral will serve many defense purposes. Resulting equipment will be carried by aircraft for protection in hostile territory. At ground installations, ECM will confuse enemy missiles.

Inquiries are invited regarding Admiral's capabilities in ECM and other forms of military electronics.

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TELETYPE

Equipment: The wide range of work in progress at Admiral, and the challenge opportunities in the field of your choice. Write: General of Engineering and Research, Admiral Corporation, Chicago 40, Illinois.

Expansions, Changes In Avionics Industry

Peltron Corp., Norwalk, Mass., is the name of a new company formed for the manufacture of high-temperature, high-voltage valves. Formerly of the Peltron line of valves, according to company president Robert Wadsworth, will be the ability to operate reliably at temperatures to 2500°.

Other recently announced aviation industry expansions and changes include:

- **Viste Corporation of America** will acquire Nuts Clack, Inc., of Silver Spring, Md., an exchange for 115,000 shares of Viste common stock, valued at about \$5,000,000, according to a press management announcement.

- **ITT Corporation Division** will launch new manufacturing facilities in Palo Alto, Calif., mainly to produce hermetic seals, valves and other semiconductor assemblies. New plant contains approximately 3,000 sq. ft.

- **Bosch Aviation's Computer Division** has announced expansion program to increase output of its general purpose computers by over 100 units annually.

- **General Electric's** Cincinnati air engine plant has added new IBM memory storage unit Model 716, to its IBM 704 Data Processing System. Company states that addition of the memory storage unit, with its capacity of 52,795 words, results in the most powerful computer presently available.

- **National Company, Inc.,** Milford, Mass., has secured a Signal Corps Supply Agency contract for \$625,515 for the development of military Avionics (aircraft cockpit), according to H. C. Guterstein, chairman of the board. Unit has been assigned to guide, radar, radio, navigation, communications and scheduling systems.

- **Avionics Division of ACF Industries, Inc.** has consolidated its New Jersey facilities with occupancy of third building in Paterson, (N. J.) Industrial Park off Route 17. A previous location by Avionics Wires, did not make close, only New Jersey facilities were included.

CAA Contracts Study On Radar Coverage

CIVIL Aeronautics Administration has contracted for engineering study to find methods of expanding altitude and range coverage of CAA radar system upon offshore radar and to improve visibility of small aircraft targets when superimposed on strong local ground signals.

CAA ASR's presently average 10 nautical miles range and altitude coverage to 23,000 ft. for small twin-engine aircraft. Contract to Airborne Instruments Laboratories



NEW KLIXON C9178 Rotary Hermelic Switch

*Gives you environment-free
Precision Switching*

The new KLIXON C9178 rotary hermetic switch is designed for such precise applications as aircraft landing gear controls, guided missile launchers, radar equipment, engine controls and industrial equipment.

A double-pole, double-throw rotary assembly, the C9178, has two 5000-ohm Type hermetically sealed switches enclosed in a steel case to withstand heavy shock and compression loads.

The model illustrated has 360° zero, 360° rotation and is designed for positive drive in both clockwise and counter-clockwise directions. Other signals are available with limited rotation and/or rotary return. All models can be provided with stainless steel, polished brass and stainless steel designs to meet particular specifications. Technical data sheets on the C9178 and many other types of hermetic and non-hermetic switches are available. Write for FREE Catalog.

FEATURES of the

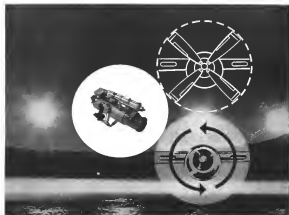
C9178 include:

- **Complete Environment-Free** — None motion, shock to metal work.
- **Sturdiness** — With 10" of motion.
- **Excellent Shock and Vibration Resistance** — Shock 20 G's minimum; vibration of 40 G's, 0-2000 cps, per Paragraph 1, MIL-STD-203A.
- **High Current Capacity** — 18 square inches, 10 mV DC, 112 mV AC.
- **Minimum Size** — envelope measures 1 3/8" x 1 1/2" x 1 1/2".
- **Temperature of Ambient Temperature** — can be used in ambient from -55° to +125°.

METALS & CONTROLS CORPORATION
Spencer The metal Division

3100 Ford Street, Allentown, Pa.

Kupco



new light
on a cold problem
by

Janitrol

In the heat of the midnight sun—or anywhere the temperatures drop down to -65°F and stay there—Janitrol hot fuel pump systems provide positive engine starting in a matter of minutes. In a series of tests for example, a Curtiss-Wright turbo-compound engine which had been cold soaked for three solid days at -65°F was started in 60 seconds and running clear in 3 minutes. This was not an isolated case. The Janitrol unit does it repeatedly.

The unit is less than 18 inches long, weighs under 16 pounds, heats fuel from -65°F to 260°F and supplies hot fuel at the rate required as long as necessary to insure smooth starts.

Janitrol's broad experience in solving such problems has led to other important developments, such as heated high-temperature high-pressure components; pneumatic controls, heat exchangers, and purge gas systems. Call your nearby Janitrol representative, Janitrol Aerojet-Automatic Division, Surface Combustion Corporation, Columbus 16, Ohio.

Stock Transactions

Washington—Acquisition of 2,475,142 common shares of Trans World Airlines, Inc., stock by exercise of rights, etc., by The Hughes Tool Co., beneficial owner, has been reported by the Securities and Exchange Commission. Hughes Tool Co. total now 6,952,284. Other transactions reported from June 11 to July 10 include:

BEI Industries, Inc. Acquisition of 100 common shares for 2 P. Clark officers and director for a holding of 1,000.
Gene Ruppel Manufacturing Co. In the acquisition of 200 common shares by Betty M. Ruppel, director, for a holding of 40,000 with the Investor Services Corp. beneficial holding in 10,000 common shares.

Aerovoy Inc. Dividend of 100 common shares by Patricia R. Garcia, officer, for a holding of 10,000. Dividend of 100 common shares by Charles J. Goff, officer and director, for a holding of 10,000.
AP Industries Co., Inc. Acquisition of 1,000 common shares through exercise of notes and dividend of 100 common shares by John D. Quicker, officer, for a holding of 1,000. Dividend of 100 common shares by John H. Lusk, officer, for a holding of 10,000. Dividend of 100 common shares by P. Ruppel, officer, for a holding of 10,000. Dividend of 100 common shares by Joseph P. Ruppel, officer, for a holding of 1,000.

20th Century Fox, Inc. Acquisition of 100 common shares for a holding of 10,000. Dividend of 100 common shares by John H. Lusk, officer, for a holding of 10,000. Dividend of 100 common shares by P. Ruppel, officer, for a holding of 10,000. Dividend of 100 common shares by Joseph P. Ruppel, officer, for a holding of 1,000. Dividend of 100 common shares by Charles J. Goff, officer and director, for a holding of 10,000. Dividend of 100 common shares by Patricia R. Garcia, officer, for a holding of 10,000. Dividend of 100 common shares by John D. Quicker, officer, for a holding of 1,000. Dividend of 100 common shares by John H. Lusk, officer, for a holding of 10,000. Dividend of 100 common shares by P. Ruppel, officer, for a holding of 10,000. Dividend of 100 common shares by Joseph P. Ruppel, officer, for a holding of 1,000.

American Stock Exch. Dividend of 100 common shares by Edward J. O'Brien, officer, for a holding of 10,000. Dividend of 100 common shares by John H. Lusk, officer, for a holding of 10,000. Dividend of 100 common shares by P. Ruppel, officer, for a holding of 10,000. Dividend of 100 common shares by Joseph P. Ruppel, officer, for a holding of 1,000. Dividend of 100 common shares by Charles J. Goff, officer and director, for a holding of 10,000. Dividend of 100 common shares by Patricia R. Garcia, officer, for a holding of 10,000. Dividend of 100 common shares by John D. Quicker, officer, for a holding of 1,000. Dividend of 100 common shares by John H. Lusk, officer, for a holding of 10,000. Dividend of 100 common shares by P. Ruppel, officer, for a holding of 10,000. Dividend of 100 common shares by Joseph P. Ruppel, officer, for a holding of 1,000.

Gene Ruppel Manufacturing Co. In the acquisition of 200 common shares by Betty M. Ruppel, director, for a holding of 40,000 with the Investor Services Corp. beneficial holding in 10,000 common shares.

BEI Industries, Inc. Acquisition of 100 common shares for 2 P. Clark officers and director for a holding of 1,000.
Gene Ruppel Manufacturing Co. In the acquisition of 200 common shares by Betty M. Ruppel, director, for a holding of 40,000 with the Investor Services Corp. beneficial holding in 10,000 common shares.

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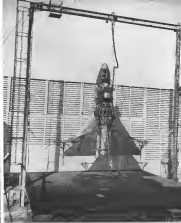
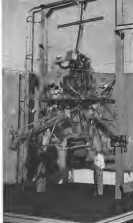
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BY 1952 Ryan obtained USAF funds to build the X-13 flight test vehicle. Pictures below show X-13 mounted on self-erecting "pogo" cradle for vertical testing, both before and after. Ryan said that at that time they feared the Roth-Boyer Avionics (wholet the only available 10,000 lb. powerplant with a thrust-to-weight ratio sufficient for three VTOL. During May 25, 1956, the X-13 made 5.9 minute flights as a subsonic. Flights lasted they could set the X-13 down within six inches of a mark. Black-on to cables were also projected (right).

How X-13 Developed From Static Test Bed to Aircraft

ON NOVEMBER 18, 1956, transition to vertical and back was accomplished after a conversion take-off (right). Earlier in the program the X-13 had been checked out for horizontal flight (below) and a roll and yaw diverter had been added.



BY 1950 the J31 was "being" up and down between two guidance rails (left). The first flight above the guidance rails was on May 12, 1951 and according to Ryan was the world's first free hovering jet flight by remote control. A crude engine was added (right) and on November 24, 1951 Ryan said they had achieved the first piloted hovering jet flight.

ON NOVEMBER 18, 1956, transition to vertical and back was accomplished after a conversion take-off (right). Earlier in the program the X-13 had been checked out for horizontal flight (below) and a roll and yaw diverter had been added.



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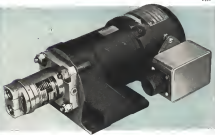
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AVIATION WEEK, August 26, 1952

...for Vanguard Earth Satellite Rocket Vehicle

The overall length is less than 10 inches. For further information about Vickers miniaturized hydraulic components and complete packages, ask for Bulletin A-5216.

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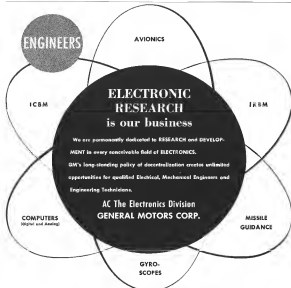
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AVIATION WEEK, August 24, 1957



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LETTERS

Replies to Saven

Re the letter in the issue of July 27 by C. N. Szymo of ALFA (p. 115) concerning the Specific rate. It might be well to direct attention for a moment and examine the letter for what it says—not what it seems to say.

Item "On the basis of local and un-
verified newspaper reports." As I recall
most writers have referenced the article
which appeared in *AW*, which was much
less brief than the news report.

was obviously had all the information that was available to ATTC and his defense was the same as (b)(7) — that Capt. Spier had an emergency.

him "condemned without a jury-trial, a right to be heard, or a trial." The report that I read indicated that the Captain's license was suspended until a full investigation could be made. Mr. Taylor's remarks about this are extremely enlightening and calculated to make it seem as if the Constitution were being brought in the door. He seems to forget that it was on record of violating a law is often held as detraction—disgrace of his leadership—and the charges can be proven or disproven. This practice is accepted as necessary in the past and routine of the community.

That is in no manner connected with his guilt or innocence.

But underneath, we have a spring in the face. "Yes! Mr. Scott, we received after reading your letter we still are. That letter contained the above comment and then, as has been true of the previous defenses of Spock, carefully did not get to the facts. The cases are huge on a supposed emergency. Why do the defenders of Spock want defining the emergency? It is a useful device to us that the facts are too complex to face, we both . . . but it is a good useful to them, we do not want them laid to rest. If Mr. Scott does have a definable position he has, as our reviewer did not, notified it."

Mr. Sarraf has made a series of statements and issued charges against CNA, some of which are substantiated in his letter. If he has information—"the facts"—which reflects to support those allegations, it is not his privilege, it is his duty, to reveal those to their subjects. If he has no such information, if his remarks are prompted by a pique or consideration, his position is untenable and

the integrity of his organization. Close upon his heels, let's have the facts out on an exhibition of AEP's loyalty and goodwill here.

Joan B. Mills and Lynn
Carmichael, CBQ

The letter of ALFA President Clarence N. Saxon quoted in the July 29 issue of *Aviation Week* (p. 115) denouncing Capt. Spacht and condemning the CAA and the congresses in that unfortunate case, seems upon the defense of Capt. Spacht made by the ALFA during the hearing before the CAB. We've now applied the arbiter of ALFA.

Atlantic Week welcomes the opinion of its readers on the letters sent in the magazine's editorial columns. Address letters to the Editor, *Atlantic Week*, 330 W. 42nd St., New York 36, N. Y. Try to keep letters under 300 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

is defending one of its members, but not by using overt worded controllers as shopping bags.

This Association is significantly associated to ALPS of the motor in which the connotation, called as witness for Capt. Spicket, was co-examined by the ALPS, hence as if there were adverse hostile witnesses. The witnesses did not, however, enter into the merits of the case with respect to either Capt. Spicket or the controllers involved, so that it is not presumed that an impartial and fair hearing would be conducted by CSM and that any possible evidence of the case not examined would be indicated in the findings of the CSM. Exemption

The only language contained in the report which in any way reflects on the control system is contained in footnote of the Executive report on p. 41 and is cited as follows:

¹³ The camera does not enter random or randomize the screen of the roadway. During this period were the case is unrelated to the question on.

admission. Although this is possible, he believes that Capt. Spicci is suggesting a change in attitude without apparent reason. The question might have been obtained in the use of a little tact and patience, on the part of the controller. It is evident that the controller misused Capt. Spicci's report as an excuse and made it for his own use and because of his attitude was not responsive to the degree of tact that is to be expected. They suggested an alternative such as a different control, the possibility of obtaining either 10,000 or 15,000 ft. in altitude, or the possibility of admission.

The above findings, when viewed in relation to the report as a whole and its findings indicate that CUB Enforcer 8 Thomas James conducted the hearing in a thorough and impartial manner and that air traffic control was not at fault in this case.

Controls and pilots must work together as a team and to place them in the middle of this controversy, again as indicated in the Senate letter after the case has been completed by the CMI. Passenger is not considered protected. I suggest that the Spott case be dropped and that we concentrate on preventing similar incidents in the future.

Gregory P. Sawyer
Executive Director
Air Traffic Control Area
Arlington, Va.

Coin's Other Side

A (Happ) [Schlepper] (AW May 22 p. 154), An (Lwapp) [Hammade] (AW June 17 p. 122), and Engaged Kigwa (AW July 2, p. 154) have used some common (and possibly, disguised) phrases about the current industry and its engineering working conditions. The implication is that Happ is only the way in which computers. I get the feeling that they have worked nowhere else and thus may have a limited view which magnifies the good out of existence.

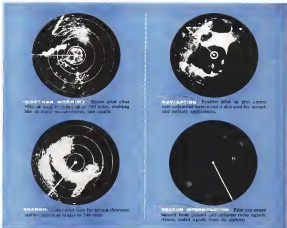
I was asked for a large number of home samples. Very few supervisors who I worked and with whom I was acquainted were impressed or "moved" by my home life work. It would be a pain supervisor who could not judge a man's output by spoken but had to start to question as measured by hours expended at his desk. This is the same philosophy that puts an engineer on the time clock and figures that if he comes in at 8:00 a.m. and goes out at 4:30 p.m. he must have done eight hours work. Strangely enough most supervisors deemed the positions to which they were promoted

True, some people did leave for the good pay offered, but I also saw two cases where engineers were fired (vs. actually fired) for not obviously severely perform- ing. How often does this happen in "old line" civilian companies?

[illegible]

To Giuseppe Moscovider and Disputed Engineers' question as to where the lost in transit can now get paid so much more so little, the answer must be an even larger separation, certain is defense. It takes much longer to locate the dead since he can be transferred in many different jobs in an attempt to find a slot for him. It just so happens that several engineers are more confident about jobs in general, and such programs as Airborne Warning are willing to pay for their rates for the elements of all (see below).

Victor M. Genna
Electronics Engineer
Carroll Ann. Lab.
Buffalo, N. Y.



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